

Report No.: 8003-431 Rev. No.: 1

1/25/95

FINAL DRAFT
SITE INSPECTION
LCP CHEMICALS, INC.
LINDEN, UNION COUNTY, NEW JERSEY
PREPARED UNDER

WORK ASSIGNMENT NO. 038-2JZZ CONTRACT NO. 68-W9-0051

> JUNE 16, 1995 UPDATED: JULY 24, 1995

> > **VOLUME 1 of 4**

SUBMITTED BY:

DAVID S. KAHLENBERG

SITE MANAGER

STEVEN T. MCNULTY

TASK LEADER

JOHN L. SPLENDORE, P.E.

WORK ASSIGNMENT MANAGER

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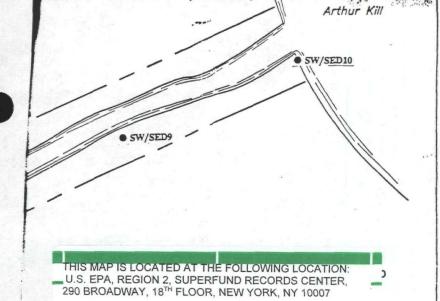
### SITE SUMMARY

The LCP Chemicals (LCP) site is situated on the Tremley Point Peninsula adjacent to the Arthur Kill, in Linden, Union County, New Jersey. The site is located in an industrial area and is bordered by the South Branch Creek (SBC) to the east, the General Aniline and Film Corporation (GAF) to the north, and Northville Industries, BP Corporation, and Mobil to the northeast, south and west, respectively. Figures 1 and 2 present a Site Location and Sample Location Map (Site Map), respectively.

LCP purchased the 26 acre chlorine production facility in 1972 from GAF who had owned the facility since 1942. E.I. Dupont owned the land, which according to aerial photographs, was coastal marshland prior to 1942. GAF began producing chlorine in 1961 by utilizing a mercury cell electrolysis process. This process involved the electrolysis of a sodium chloride (brine) solution in the presence of metallic mercury. The residual mercury-sodium solution was then used to hydrolyze water forming sodium hydroxide and hydrogen gas. The metallic mercury was partially recovered and recycled in a brine purification process. The remaining mercury tainted sludge was placed into the Brine Sludge Lagoon (BSL). As part of LCP operation of the BSL, lagoon supernatant was collected in a sump located in the southeastern corner of the lagoon, and piped to the site wastewater treatment system for treatment prior to being discharged to the SBC via the site's New Jersey Pollutant Discharge Elimination System (NJPDES) Permit. When LCP purchased the site they continued using the same chlorine processing method with a few minor modifications.

Overflows of supernatant from the BSL to the SBC were observed by the New Jersey Department of Environmental Protection (NJDEP) on October 30, 1972 and February 7, 1974. The overflow locations, quantities, and nature of LCP's responses are unknown. In June 1975, a brine recycle pump failed, causing a breach in the BSL to occur. An undetermined quantity of brine entered the SBC for a nine hour period. The location of the release was reported to be likely near the southeastern corner of the lagoon.

In 1976, LCP investigated ways to clean the BSL and remove the mercury wastes that were being deposited.



# RCRA FACILITY INVESTIGATION

LCP CHEMICALS-NEW JERSEY, INC.
A DIVISION OF HANLIN GROUP, INC.
LINDEN, NEW JERSEY



engineer

dssociates consulting e

PROJECT

RCRA FACILITY INVESTIGATION

LCP CHEMICALS-NEW JERSEY INC.
A DIVISION OF HANLIN GROUP, INC.
LINDEN, NEW JERSEY

TITLE

FIGURE 2: SAMPLE LOCATION MAP
Note: Sample locations are not located to scale.
Map based upon a RCRA Facility Investigation
prepared by Eder Associates Consulting Engineers, P.C.



der associates consulting engineers, p.c

LOCUST VALLEY, NEW YORK . MADISON, WISCONSIN ANN ARBOR, MICHIGAN . AUGUSTA, GEORGIA

DRAWN BY	I SCALE
MSA	1" = 100'-0"
DESIGNED BY	PROJECT No. 625-3
APPROVED BY	DWG. No.
JANUARY, 1992	1 1

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LCP contracted Chem-fix of Pittsburgh to construct a lined Chem-fix lagoon at the site to receive non-contaminated wastes. LCP operated the Chem-fix lagoon for six days during which time the lagoon received approximately 460 cubic yards (yd³) of treated brine sludge. Since it was determined that the lagoon was not a practical means of remediation, it was closed in 1983. The contents of the Chem-fix lagoon were excavated and placed into the BSL and it was subsequently backfilled, graded and seeded.

A release of 10,000 to 20,000 gallons of brine to the SBC occurred on August 20, 1979 due to sodium chloride blockage in the saturator. A brine sample was collected and analyzed at the time of the release and was determined to contain 8.3 parts per million (ppm) of mercury. The breach was reported to be subsequently remediated.

An Administrative Consent Order (ACO) was issued in 1981 which required the closure of the BSL. The BSL is a surface impoundment which is roughly the shape of a trapezoid. The lagoon was reportedly sprayed with hot tar to act as a liner at the time of its contruction. The total volume of sludge in the BSL is estimated to be 30,900 cubic yards (yd³). This sludge accumulated for more than twenty years before the lagoon was closed in 1984. Closure plans for the lagoons (BSL and Chemi-fix lagoon) were approved on November 7, 1983. During the closure of the lagoons, LCP closed their production facilities in order to eliminate employee exposure to mercury. As part of the closure of the BSL, it was dewatered, compacted, and capped with a two foot layer of clay. The closure of the lagoons was completed in 1984. LCP was also required to implement a monitoring program to evaluate the release of mercury and other metals to the environment. LCP installed monitoring wells to determine if there was any impact from the BSL on area groundwater. These wells were monitored quarterly for total organic carbon (TOC), phenols, dissolved metals, total organic halogens (TOX), and selected inorganic constituents. Several quarterly reports from 1982-1987 indicate that the concentrations of lead, chromium, cadmium, mercury, silver, and selenium exceeded the NJPDES permitted levels. The data quality associated with this sampling is unknown.

A February 1982 report entitled, "Waste Lagoon Groundwater Monitoring" (WLGM) indicates that soil samples

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were collected at six inch intervals during the installation of the site's monitoring wells and were analyzed by LCP for mercury. Analytical results of these samples indicated mercury concentrations ranging from 35.71 parts per million (ppm) to 772 ppm in the 0-2 foot interval with mercury concentrations generally decreasing with depth; mercury concentrations detected at depths of 40-47 feet ranged from 0.60 ppm to 4.59 ppm. Surface soil samples collected from the perimeter of the BSL indicated mercury levels ranging from 27.45 ppm to 1,580 ppm. In addition, analytical results of a sediment sample collected from the SBC creek bed, downstream of the BSL, indicated the presence of mercury at a level of 46.42 ppm. The data quality associated with this sampling is unknown.

In June 1984, LCP submitted a facility closure plan to the NJDEP. This closure was completed in 1985 and included the complete closure of all production areas. After the 1985 facility closure, the site continued to operate as a storage and transfer station for hydrochloric acid, sodium hydroxide, potassium hydroxide, and methylene chloride that was produced at other LCP facilities. Dismantling activities have been ongoing since the facility's closure. Other products produced by LCP included caustic soda, hydrochloric acid, and bleach. In addition, stormwater collects in drainage swales surrounding the former process area and is routed to a concrete sump south of site building number 231. Runoff is piped to holding tanks outside site building number 233 and is pH adjusted, filtered, treated and stored pending discharge to the SBC in accordance with the site's NJPDES Permit.

On September 27, 1984, an EPA contractor conducted a Site Inspection (SI) at the LCP site which included the collection of three groundwater, two surface water, two sediment and two soil samples. Analytical results of the groundwater samples indicated the presence of inorganic constituents (ie. arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, and zinc), however, the significance of the constituent levels remains inconclusive due to the lack of an adequate background sample. Surface water and sediment sample results indicated the presence of cadmium, copper, lead, and mercury at levels exceeding three times background levels, however, since the samples were collected in reverse order (ie. upstream to downstream), an observed release cannot be scored due to the potential for interferences. In addition, a

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sufficient number of surface water/sediment samples were not collected from the tidally-influenced SBC to identify whether any of the substances detected are attributable to potential downstream sources. Analytical results of the soil samples were not conclusive as a background sample was not collected. All of the analytical data from the EPA SI were generated by the EPA Contract Laboratory Program (CLP) and were subjected to all applicable Region II data validation criteria.

On December 14, 1994, an EPA contractor conducted an on-site reconnaissance of the LCP site. During this reconnaissance it was noted that all site storage/transfer activities had ceased and that all of the mercury cells and other production equipment had been removed from the site as all of the production buildings were vacant.

On January 11, 1995, an EPA contractor conducted a site inspection (SI) sampling event at the LCP site. As part of this SI sampling event three surficial soil samples, ten surface water and eight sediment samples were collected at the site. Analytical results of the surficial soil samples (MBKW78(SL2)/MBKW79(SL3)) collected downslope of the BSL indicated the presence of mercury (98,900 micrograms per kilogram ( $\mu$ g/kg) to 110,000  $\mu$ g/kg), lead (304,000 E  $\mu$ g/kg), and zinc (833,000  $\mu$ g/kg) at levels greater than three times the levels found in background surficial soil sample MBKW74 (SL1). Analytical results of the surface water/sediment samples documented that an observed release of mercury had occurred from the site to the surface water pathway. In addition, the analytical results of the surface water/sediment samples identified a zone of actual contamination which contains 0.43 miles of wetlands frontage and a state designated area for the maintenance and protection of aquatic life. All of the analytical data from the 1995 EPA SI were generated by the EPA CLP and were subjected to all applicable Region II data validation criteria.

Groundwater has not been identified as a source of drinking water within four miles of the site. The residential population in the site's vicinity relies primarily on surface water as a source for potable water. The water is drawn from surface water intakes that are not located along the site's surface water pathway.

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The SBC flows southeast 0.31 miles before discharging into the Arthur Kill which then flows south for 9.99 miles where it empties into the Raritan Bay. All of the surface water bodies located along the site's surface water pathway are tidally influenced. The Arthur Kill and Raritan Bay have been identified as fisheries. There are no residences, schools, daycare centers, or terrestrial sensitive environments identified within 200 feet of the site property. There is no documentation available to indicate that an observed release of contaminants has occurred from the site to air.

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# SITE ASSESSMENT REPORT: SITE INSPECTION

PART I: SITE INFORMATION

-		Site Name/Alias: LCP Chemicals, Inc.						
		1 - 434		South Wood Avenue	Street			
	07036	State New Jersey Zip		nden	City L			
-	Cong.Dist.	County Code 013		Union	. County	2.		
	<u> </u>		20	ID NO. NJD07930302	. CERCL	3.		
		Lot No. 3		587	. Block N	4.		
	<b>/</b>	Longitude 74°12'37"W		40°36'27"N	. Latitude	5.		
		lersey	ew York - New	uad. Arthur Kill, Ne	USGS			
			acres	nate size of site 26 a	6. Approx	6.		
		0. (908) 862-1666	Telephone 1	Hanlin Group, Inc.	. Owner	7.		
-			9	South Wood Avenue	Street			
	Zip <u>07036</u>	State New Jersey		nden	City _			
					Onorot	Q		
	8) 862-1666	Telephone No(90		LCP Chemicals, Inc.	. Operati	0.		
		Telephone No(90				J.		
			е	South Wood Avenue	Street	3.		
			е	South Wood Avenue	Street City _			
			е	South Wood Avenue	Street City _			
	sey Zip <u>07036</u>	State New Jers	9	South Wood Avenue	Street City _  Type of _ X F			
	sey Zip <u>07036</u>	State New Jers	Federal Municipal	South Wood Avenue inden Ownership ivate	Street  City _  Type of _  X F	9.		
	sey Zip <u>07036</u>	State New Jers	Federal Municipal	South Wood Avenue Inden Ownership ivate	Street  City _  Type of _  X F _  (0. Own	9.		
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### 11. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments
		100000		<del>Solutions</del>
RCRA	NJD079303020	8/13/80		RCRA Part A (hazardous waste generator)
NJPDES	NJ0003778	8/10/87	4/30/91	Discharge to Surface Water
NJPDES	NJ0003778	10/30/87	11/29/92	Discharge to Ground Water
APC	044133	3/3/80	10/5/82	Air Pollution Control (Sludge Roaster System)
Air Permit	067418		2/17/89	Boiler Stack
Air Permit	020928		11/9/85	Pura-SIV stack
Air Permit	037033		3/26/89	Mercury Cell Destruct Tower
Air Permit	040435		3/26/88	Mercury Cell Destruct Tower
Air Permit	076056		5/15/87	Mercury Cell Destruct Tower
Air Permit	036994		6/11/88	HCL Scrubber
Air Permit	036993		11/20/88	HCL Scrubber
Air Permit	035067		3/28/88	HCL Scrubber

### 12. Site Status

Active

X Inactive

Unknown

13. Years of Operation:

1950 to 1985

- 14. Identify the types of waste sources (e.g., landfill, surface impoundment, piles, stained soil, above- or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.
  - (a) Waste Sources

Waste Unit No.	Waste Source Type	Facility Name for Unit		
1	Lagoon	Brine Sludge Lagoon		
2	Contaminated Soil	Contaminated Soil		
3	Other	Brine Sludge Spill		

### (b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

The following areas were identified as areas of concern or areas where hazardous waste generation, treatment, storage, and disposal occurred at the site according to the 1992 RCRA Facility Investigation of the LCP Chemical site: Chem Fix Lagoon, Salt Silo No. 4, Process Areas in Buildings 230 and 240, 500 K Tank, Bullet Tanks, Area South of Building 231, Drum Storage Area, Lined Trenches, Transformers, Process Sewers, Building 233, Brine Sludge Roaster, and GAF Wastewater Treatment Area.

Ref. Nos. 1; 10, pp. 7-17, 20, 28-30; 15, pp. 21-29, 49-55, 59-61

15. Information available from

Contact Joseph Hudek Agency U.S. EPA Telephone No.: (908) 321-6717

Preparer David Kahlenberg Agency MALCOLM PIRNIE, INC. Date: July 24, 1995

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### PART II: WASTE SOURCE INFORMATION

For each of the	e waste units identified	I in Part	t I, complete the following items	
Waste Unit	_1		Brine Sludge Lagoon	
Source Type				
	Landfill			Contaminated Soil
X	Surface Impoundmen	nt		Pile
	Drums			Land Treatment
	Tanks/Containers			Other

### Description:

LCP utilized a mercury cell electrolysis process to produce chlorine. This process involved the electrolysis of a sodium chloride (brine) solution in the presence of metallic mercury. The residual mercury-sodium solution was then used to hydrolyze water forming sodium hydroxide and hydrogen gas. The metallic mercury was partially recovered and recycled in a brine purification process. The remaining mercury tainted sludge was placed into the BSL.

The BSL is a surface impoundment which is roughly the shape of a trapezoid. The lagoon was reportedly sprayed with hot tar to act as a liner at the time of its contruction. Closure plans for the lagoon were approved on November 7, 1983. As part of the closure of the BSL, it was dewatered, compacted, and capped with a two foot layer of clay. The closure of the lagoon was completed in 1984.

### **Hazardous Waste Quantity**

The BSL is an unlined surface impoundment containing 30,900 yd3 of dewatered sludge.

### Hazardous Substances/Physical State

The hazardous substance associated with the BSL is mercury which was deposited in a sludge state.

Ref. Nos. 10, pp. 7, 12-14; 13, pp. 4, 7, 12, 17-18; 14, pp. 1-7; 15, pp. 6, 9-10, 21, 24-25, 49-53, 107-116, 195-198, 279, 321

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### PART II: WASTE SOURCE INFORMATION

waste units identi	fied in Part	I, complete the follow	ing items.	
2		Contaminated Soil		
Landfill			X	Contaminated Soil
Surface Impound	ment	- p		Pile
Drums				Land Treatment
Tanks/Containers	S			Other
three surficial soil W78(SL2)/MBKW7 000 µg/kg), lead (3	samples w (9(SL3)) co (804,000 E µ	vere collected at the stillected at the site indicag/kg), and zinc (833,	te. Analyt cated the 000 µg/kg	ical results of the surficial soil presence of mercury (98,900
	Landfill Surface Impound Drums Tanks/Containers  , 1995, an EPA containers three surficial soil W78(SL2)/MBKW7	Landfill  Surface Impoundment  Drums  Tanks/Containers  , 1995, an EPA contractor containers with three surficial soil samples with the surficial soil sampl	Landfill  Surface Impoundment  Drums  Tanks/Containers  , 1995, an EPA contractor conducted a SI sampling at three surficial soil samples were collected at the site W78(SL2)/MBKW79(SL3)) collected at the site indication μg/kg), lead (304,000 E μg/kg), and zinc (833,000 E μg/kg).	Landfill X  Surface Impoundment  Drums

# **Hazardous Waste Quantity**

The area of contaminated soil is greater than zero square feet in size.

# **Hazardous Substances/Physical State**

The hazardous substances are present in a solid state and consist of lead, mercury, and zinc.

Ref. Nos. 16, pp. 5, 7; 17, pp. 4, 66-68; 18; 19

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### PART II: WASTE SOURCE INFORMATION

For each of th	e waste units identifie	ed in Pari	t I, complete the following ite	ms.
Waste Unit	3_		Brine Sludge Spill	
Source Type				
	Landfill			Contaminated Soil
	Surface Impoundm	ent		Pile
	Drums			Land Treatment
	Tanks/Containers		X	Other
Description:				

On August 15, 1979, a sodium chloride pluggage occurred in the facilities east saturator. This caused sodium chloride contaminated with inorganic mercury to overflow the top of the saturator. The surge of flow exceeded the surge capacity of the wastewater system. This caused an estimated 10,000 to 20,000 gallons of the brine to flow into South Branch Creek. Chemical analysis of a sample collected from the spill indicated mercury concentrations to be 8.6 ppm.

### **Hazardous Waste Quantity**

A spill of approximately 10,000 gallons of mercury tainted sludge.

### Hazardous Substances/Physical State

The hazardous substance present in the spill was mercury in a sludge state.

Ref. No. 15, pp. 16, 195-198

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### PART III. SAMPLING RESULTS

A release of 10,000 to 20,000 gallons of brine to the SBC occurred on August 20, 1979 due to sodium chloride blockage in the saturator. A brine sample was collected and analyzed at the time of the release and was determined to contain 8.3 parts per million (ppm) of mercury (Ref. No. 15, pp. 16, 195-198). The breach was reported to be subsequently remediated (Ref. No. 15, p. 16).

On January 11, 1995, an EPA contractor conducted a SI sampling event at the LCP site (Ref. Nos. 16-19; 22). As part of this SI sampling event three surficial soil samples, ten surface water samples and eight sediment samples were collected at the site. Analytical results of the surficial soil samples (MBKW78(SL2)/MBKW79(SL3)) collected at the site indicated the presence of mercury (98,900  $\mu$ g/kg to 110,000  $\mu$ g/kg), lead (304,000 E  $\mu$ g/kg), and zinc (833,000  $\mu$ g/kg) at levels greater than three times the levels found in background surficial soil sample MBKW74 (SL1) (Ref. Nos. 16, pp. 5, 7; 17, pp. 4, 66-68; 18; 19; 22, pp. 1-13). Table 1 on the following page summarizes the surface water/sediment sampling results for the samples collected from the tidally influenced South Branch Creek, while Table 2 summarizes the surficial soil sample results. It should be noted that the MBKW54/MBKW64 (SW1/SED1) samples were collected beyond the head of tidal influence of the South Branch Creek (Ref. Nos. 19; 20). All of the analytical data from the 1995 EPA SI were generated by the EPA CLP and were subjected to all applicable Region II data validation criteria (Ref. Nos. 17, pp. 5-42; 22, pp. 14-39, 112-117).

Several other sampling events have occurred at the LCP site, however, only the sampling events presented in this section will be utilized in the evaluation of the site score.

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Table 1: Surface Water/Sediment Sampling Mercury Results

General Sample Location	Sample Number	Sample Type	Mercury Concentration	Reference(s)
Upstream Background	MBKW54 (SW1)	surface water	1.2 μg/L	16, pp. 3, 7; 17, pp. 2, 43
	MBKW64 (SED1)	sediment	8,800 E μg/kg	16, pp. 4, 7; 17, pp. 3, 8, 58; 18
At LCP Outfall	MBKW56 (SW3)	surface water	93 μg/L	16, pp. 3, 7; 17 pp. 2, 45
	MBKW66 (SED3)	sediment	1,060,000 E μg/kg	16, pp. 4, 7; 17 pp. 3, 8, 59; 18
Adjacent to BSL	MBKW58 (SW5)	surface water	44.6 μg/L	16, pp. 3, 7; 17 pp. 2, 47
	MBKW68 (SED5)	sediment	187,000 μg/kg	16, pp. 4, 7; 17 pp. 3, 61
Downstream of BSL	MBKW59 (SW6)	surface water	65.3 μg/L	16, pp. 3, 7; 17 pp. 2, 48
	MBKW60 (SW7)	surface water	60.2 μg/L	16, pp. 3, 7; 17 pp. 2, 49
	MBKW62 (SW9)	surface water	2 μg/L	16, pp. 4, 7; 17 pp. 2, 51
	MBKW69 (SED6)	sediment	350,000 E μg/kg	16, pp. 4, 7; 17 pp. 3, 8, 62; 18
	MBKW70 (SED7)	sediment	470,000 E μg/kg	16, pp. 4, 7; 17 pp. 3, 8, 63; 18
	MBKW72 (SED9)	sediment	433,000 E μg/kg	16, pp. 5, 7; 17 pp. 3, 8, 64; 18
Downstream Background	MBKW63 (SW10)	surface water	3.7 μg/L	16, pp. 4, 7; 17 pp. 2, 52
	MBKW73 (SED10)	sediment	56,900 E μg/kg	16, pp. 5, 7; 17 pp. 3, 8, 65; 18

Note: The above sampling results are from the 1995 EPA Site Inspection.

 $\mu g/L$ : micrograms per liter  $\mu g/kg$ : micrograms per kilogram

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Table 2: Surface Soil Sampling Results

General Sample Location	Constituent Detected	Sample Number	Sample Type	Sample Depth (feet)	Concentration	References
Background	Lead	MBKW74 (SL1)	Soil	0 - 0.5	63,100 μg/kg	16, pp. 5, 7; 17, pp. 4, 66
	Mercury	MBKW74 (SL1)	Soil	0 - 0.5	26,500 μg/kg	16, pp. 5, 7; 17, pp. 4, 66
	Zinc	MBKW74 (SL1)	Soil	0 - 0.5	196,000 µg/kg	16, pp. 5, 7; 17, pp. 4, 66
On-Site	Lead	MBKW78 (SL2)	Soil	0 - 0.5	304,000 E µg/kg	16, pp. 5, 7; 17, pp. 4, 67; 18
	Mercury	MBKW78 (SL2)	Soil	0 - 0.5	110,000 µg/kg	16, pp. 5, 7; 17, pp. 4, 67
	Mercury	MBKW79 (SL3)	Soil	0 - 0.5	98,900 μg/kg	16, pp. 5, 7; 17, pp. 4, 68
	Zinc	MBKW78 (SL2)	Soil	0 - 0.5	833,000 µg/kg	16, pp. 5, 7; 17, pp. 4, 67

Note: The above sampling results are from the 1995 EPA Site Inspection

μg/kg: micrograms per kilogram

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### PART IV. HAZARD ASSESSMENT

### **GROUNDWATER ROUTE**

 Describe the likelihood of a release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

A release of contaminants from the site to groundwater is not documented. Analytical results of several quarterly NJPDES reports from 1982-1987 indicate that concentrations of lead, chromium, cadmium, mercury, silver, and selenium have exceeded the NJPDES permitted levels. It should be noted that there is a lack of QA/QC information regarding the data quality associated with the abovementioned analytical results. In 1984, as part of an EPA SI at the LCP site, three groundwater samples were collected. Analytical results of these samples indicated the presence of inorganic constituents (ie. arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, and zinc), however, the significance of the constituent levels remains inconclusive due to the lack of an adequate background sample to account for the site's tidal influences. Therefore, an observed release of contaminants from the site to the groundwater has not been documented, but is suspected.

Ref. Nos. 10, pp. 10, 13; 13, pp. 25, 81-102

2. Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.

A layer of unconsolidated fill consisting of silts, sands, gravel, crushed stone and brick comprises the first 10 to 15 feet below the site surface. The hydraulic conductivity associated with this unit is approximately 10<sup>-8</sup> centimeters per second (cm/sec). A dark grey clay layer underlies the unconsolidated deposits for approximately 25 to 35 feet before reaching the bedrock. The hydraulic conductivity associated with this unit is approximately 10<sup>-8</sup> cm/sec. The red-brown shale bedrock at the site exists at a depth of approximately 40-50 feet. The hydraulic conductivity associated with the bedrock is approximately 10<sup>-8</sup> cm/sec. The water table is five to ten feet below grade and the groundwater is brackish due to the tidal influence from the surrounding water bodies.

Ref. Nos. 9; 10, pp. 9-12; 12, pp. 5, 12-16, 25-31; 13, pp. 25, 77, 81-102; 15, pp. 12-13

3. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?

The lowest point of waste disposal is assumed to be between 0-0.5 feet below the site's natural ground elevation based upon the surficial soil samples collected during the 1995 EPA SI. The depth to groundwater at the site is approximately 5 feet. Therefore, the depth from the lowest point of waste disposal to the highest seasonal level of the saturated zone would be 4.5 feet.

Ref. Nos. 10, pp. 9-12; 12, pp. 5, 12-16, 25-31; 13, pp. 25, 77, 81-102; 15, pp. 12-13; 16, p. 5

4. What is the distance to and depth of the nearest well that is currently used for drinking purposes?

Groundwater is not utilized as a source of potable water within 4-miles of the site.

Ref. No. 4

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If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contamination boundary of the release.

A release of contaminants from the site to groundwater is not documented.

Ref. Nos. 4; 10, pp. 10, 13; 13, pp. 25, 81-102

Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

Distance	Population
0 - 1/4 mi	0
>1/4 - 1/2 mi	0
>½ - 1 mi	0
>1 - 2 mi	0
>2 - 3 mi	0
>3 - 4 mi	0

Ref. No. 4

State whether groundwater is blended with surface water, groundwater, or both before distribution.

Groundwater is not blended with surface water prior to distribution within four miles of the site. Surface water is the primary source for potable water within four miles of the site.

Ref. No. 4

Is a designated well head protection area within 4 miles of the site?

There have been no New York or New Jersey designated Wellhead Protection Areas identified within four miles of the LCP site.

Ref. No. 6

Does a waste source overlie a designated or proposed wellhead protection area? If a release to groundwater is observed or suspected, does a designated or proposed wellhead protection area lie within the contaminant boundary of the release?

There have been no New York or New Jersey designated Wellhead Protection Areas identified within four miles of the LCP site.

Ref. No. 6

7. Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unusable).

Although no potable wells were identified within the target distance limit, the Brunswick Formation has been identified as a potential usable source for potable water within four miles of the site.

Ref. No. 4

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### SURFACE WATER ROUTE

8. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

An observed release via direct observation to the surface water pathway was documented when a release of 10,000 to 20,000 gallons of brine to the SBC occurred on August 20, 1979 due to sodium chloride blockage in the saturator. A brine sample was collected and analyzed at the time of the release and was determined to contain 8.3 parts per million (ppm) of mercury. The breach was reported to be subsequently remediated. In addition, an observed release via chemical analysis of mercury was documented as a result of the surface water/sediment sampling of the SBC which occurred as part of a 1995 EPA contractor SI sampling event. The analytical results of the surface water/sediment sampling are summarized on Table 1.

Ref. Nos. 2; 3; 15, pp. 16, 195-198; 16-19; 22

9. Identify the nearest downslope surface water. If possible, include a description of possible surface drainage patterns from the site.

Surface water runoff from the site flows generally east towards the SBC. The SBC flows (>10 cubic feet per second (cfs)) for approximately 0.31 mile southeast before discharging into the Arthur Kill. The Arthur Kill, which is tidally influenced, flows south for 9.99 miles where it discharges into the Raritan Bay.

Ref. Nos. 2: 3: 5. p. 1

10. What is the distance in feet to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.

The nearest downslope water body is the South Branch Creek which is located immediately adjacent to the site.

Ref. Nos. 2; 3; 5, p. 1

11. Determine the type of floodplain that the site is located within.

The site is located within the 100-year flood plain.

Ref. No. 13, p. 12

12. Identify drinking water intakes in surface waters within 15 miles downstream of the point of surface water entry. For each intake identify: the name of the surface water body in which the intake is located, the distance in miles from the point of surface water entry, population served, and stream flow at the intake location.

There are no drinking water intakes located along the 15-mile surface water pathway.

Ref. Nos. 3; 5, pp. 1, 12-17

Rev. No.: 1

13. Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each fishery specify the following information:

Fishery Name	Water Body Type	Flow (cfs)	Saline/Fresh/Brackish
Arthur Kill	Coastal Tidal Water	N.A.	Brackish
Raritan Bay	Coastal Tidal Water	N.A.	Salt

Ref. Nos. 2; 3; 5, pp. 1, 18-62

14. Identify surface water sensitive environments that exist within 15 miles of the point of surface water entry.

Environment	Water Body Type	Flow (cfs)	Wetland Frontage
Wetlands	River	>10	0.62 miles
Wetlands	Coastal Tidal Water	N.A.	10.67 miles
State designated area for the protection of aquatic life	River	>10	N.A.
1 Federally Endangered Species	Coastal Tidal Water	N.A.	N.A.

Ref. Nos. 3; 5, pp. 1-11; 13, pp. 79-80; 21

15. If a release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 12-14 that are or may be located within the contamination boundary of the release.

Intakes: None

Fisheries: None

Sensitive Environments: State designated area for the maintenance and protection of aquatic life

0.43 miles of Wetlands Frontage

Ref. Nos. 3; 5, pp. 1-11; 15, pp. 16, 195-198; 16-19; 21; 22; 23

Rev. No.: 1

### SOIL EXPOSURE PATHWAY

16. Determine the number of people that occupy residences or attend school or day care on or within 200 feet of observed contamination.

There are no residences, schools or daycare centers identified within 200 feet of the site property.

Ref. No. 19, p. 12

17. Determine the number of people that regularly work on or within 200 feet of observed contamination.

There are no people identified that regularly work on or within 200 feet of observed contamination. Although there are site workers at an adjacent property to the site, there is no evidence of contaminant migration to this adjacent property.

Ref. No. 19, pp. 12, 29

18. Identify terrestrial sensitive environments on or within 200 feet of observed contamination.

No terrestrial sensitive environments have been identified on or within 200 feet of the site property.

Ref. No. 13, pp. 79-80

### AIR ROUTE

19. Describe the likelihood of release of contaminants to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release define the supporting analytical evidence.

A release of contaminants from the site to air has not been documented. There were no readings above background detected on an HNu photoionization detector or mercury vapor analyzer during either the on-site reconnaissance or site inspection sampling event, respectively.

Ref. No. 19, pp. 12, 29

20. Determine populations that reside within 4 miles of the site.

Distance	Population
0 - 1/4 mi	13
>1/4 - 1/2 mi	38
>½ - 1 mi	506
>1 - 2 mi	10,829
>2 - 3 mi	36,650
>3 - 4 mi	103,624

Ref. No. 7

Rev. No.: 1

21. Identify sensitive environments, including wetlands and associated wetlands acreage, within 4 miles of the site.

Distance	Wetlands Acreage	Sensitive Environment
0 - 1/4 mi	5	None Identified
>1/4 - 1/2 mi	1	None Identified
>½ - 1 mi	217	1 Federally Endangered Species
>1 - 2 mi	462	None Identified
>2 - 3 mi	506	None Identified
>3 - 4 mi	351	None Identified

Ref. Nos. 3; 8; 13, pp. 79-80

22. If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of air contamination from the release.

A release of contaminants from the site to air is neither observed nor suspected. There were no readings above background detected on an HNu photoionization detector or mercury vapor analyzer during either the on-site reconnaissance or site inspection sampling event, respectively.

Ref. No. 19, pp. 12, 29

23. If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 21, that are or may be located within the area of air contamination from the release.

A release of contaminants from the site to air is neither observed nor suspected. There were no readings above background detected on an HNu photoionization detector or mercury vapor analyzer during either the on-site reconnaissance or site inspection sampling event, respectively.

Ref. No. 19, pp. 12, 29

This Report was conducted under the following USEPA Documentation Procedure

Guidance for Performing Site Inspections Under CERCLA Interim Final Publication 9345.1-05

# ATTACHMENT 1

### EXHIBIT A

PHOTOGRAPH LOG

LCP CHEMICALS, INC. LINDEN, UNION COUNTY, NEW JERSEY

SITE RECONNAISSANCE

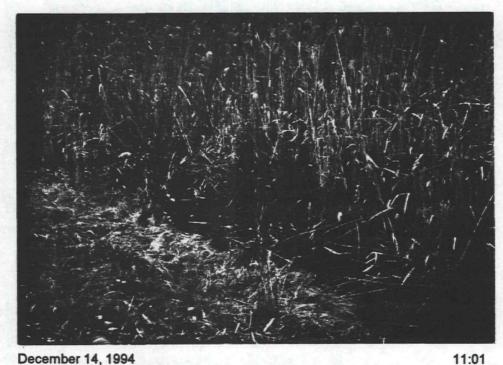
**DECEMBER 14, 1994** 

# Photograph Index LCP Chemicals, Inc. Linden, New Jersey

# December 14, 1994

# All Photographs taken by Jin Ho Jang

Photo No.	Description	Time
1	View looking northeast along the railroad tracks, from the site's NJPDES permitted outfall, at an upgradient intermittent stream.	11:01
2	Photo of the discharge from a drainage pipe originating from GAF Corporation, north of the LCP site's NJPDES permitted outfall.	11:02
3	View of the site's NJPDES permitted outfall at the northernmost end of the South Branch Creek.	11:02
4	Photo of the abandoned pipe associated from with Elizabethtown Water Company line.	11:05
5	Photo looking east at the origins of the South Branch Creek and the Avenue B bridge from the site's railroad bridge.	11:07
6	Photo looking west at the origins of the South Branch Creek and the site's railroad bridge from Avenue B.	11:17
7	Photo looking downstream (southeast) at the South Branch Creek from the northern edge of Avenue B and the LCP property.	11:24
8	Photo looking downstream (southeast) along the South Branch Creek from site monitoring well P-2.	11:37
9	Photo looking upstream (northwest) along the South Branch Creek from site monitoring well P-2.	11:38
10	Photo of one of the site's new monitoring wells located adjacent to site monitoring well P-2.	11:42
11	Photo looking southeast at the South Branch Creek and monitoring well P-2. Note the pipeline bridge, associated with Northville Industries, which crosses the South Branch Creek before the creek discharges into the Arthur Kill.	11:51
12	Photo of a stormwater pipe outfall with the South Branch Creek. Note the outfall is located in the southwestern portion of the site.	12:08
13	View looking east along the South Branch Creek at the Northville Industries pipeline bridge from the southwestern portion of the site adjacent to the stormwater pipe outfall displayed in Photo No. 12.	12:11
14	View looking northwest of the Brine Sludge Lagoon.	12:22
15	View looking southeast of the Brine Sludge Lagoon.	12:35



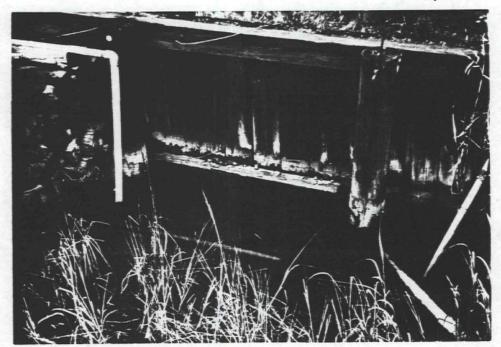
 December 14, 1994
 View looking northeast along the railroad tracks, from the site's NJPDES permitted outfall, at an upgradient intermittent stream.



December 14, 1994
Photo of the discharge from a drainage pipe originating from GAF Corporation, north of the LCP site's NJPDES permitted outfall.

2.

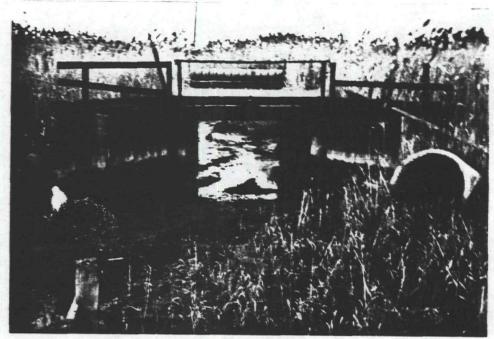
11:02



3. December 14, 1994
View of the site's NJPDES permitted outfall at the northernmost end of the South Branch Creek



December 14, 1994
Photo of the abandoned pipe associated with Elizabethtown
Water Company line.



 December 14, 1994
 Photo looking east at the origins of the South Branch Creek and the Avenue B bridge from the site's railroad bridge.

11:07



December 14, 1994

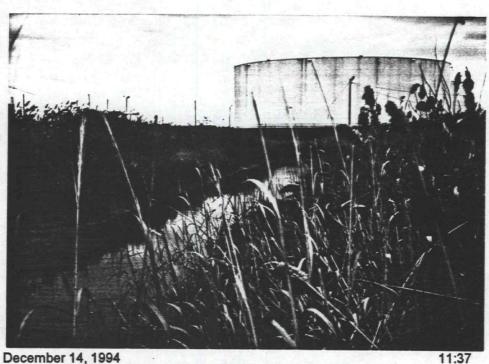
Photo looking west at the origins of the South Branch Creek and the site's railroad bridge from Avenue B.

6.

11:17



7. December 14, 1994
Photo looking downstream (southeast) at the South Branch Creek
from the northern edge of Avenue B and the LCP property.



December 14, 1994
Photo looking downstream (southeast) at the South Branch Creek from site monitoring well P-2.

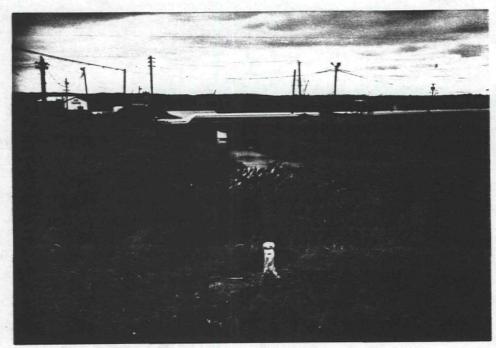


9. December 14, 1994
Photo looking upstream (northwest) along the South Branch Creek
from site monitoring well P-2.



December 14, 1994
Photo of one of the site's new monitoring wells located adjacent to site monitoring well P-2.

11:42



11. December 14, 1994
Photo looking southeast at the South Branch Creek and monitoring well P-2. Note the pipeline bridge, associated with Northville industries, which crosses the South Branch Creek before the creek discharges into the Arthur Killl



December 14, 1994

Photo of a stormwater pipe outfall with the South Branch Creek.

Note the outfall is located in the southwestern portion of the site.

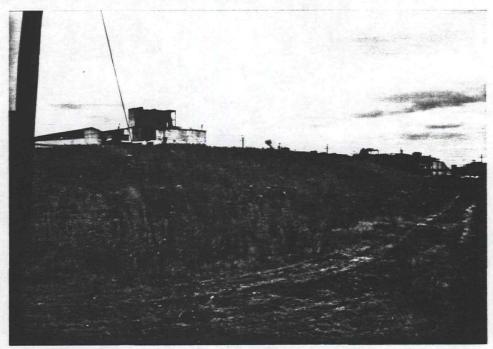


December 14, 1994

View looking east along the South Branch Creek at the Northville Industries pipeline bridge from the southwestern portion of the site adjacent to the stormwater pipe outfall displayed in Photo No. 12.

13.

14.



December 14, 1994
View looking northwest of the Brine Sludge Lagoon.



15. December 14, 1994
View looking southeast of the Brine Sludge Lagoon.

### EXHIBIT B

PHOTOGRAPH LOG

LCP CHEMICALS, INC. LINDEN, UNION COUNTY, NEW JERSEY

SITE INSPECTION SAMPLING EVENT

**JANUARY 11, 1995** 

## Photograph Index LCP Chemicals, Inc. Linden, New Jersey

### January 11, 1995

# All Photographs taken by David Kahlenberg

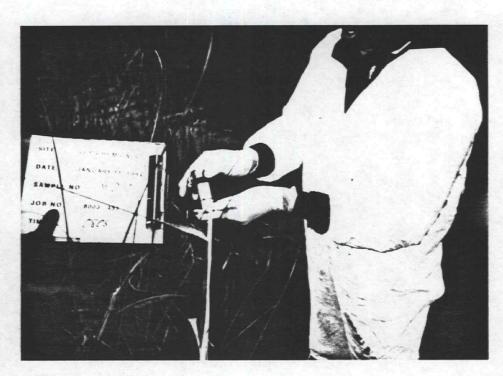
It should be noted that all of the samples were collected on January 11, 1995, and that the placards displayed in the photos were erroneously dated January 11, 1994.

Photo No.	Description	Time
1	Photo of B. Pierre collecting surface water sample SW10	0801
2.	Photo of B. Pierre collecting sediment sample SED10	0805
3.	Photo of J. Jang collecting surface water sample SW9	0820
4.	Photo of J. Jang collecting sediment sample SED9	0826
5.	Photo of J. Jang collecting duplicate surface water samples SW6/SW7	0846
6.	Photo of B. Pierre collecting duplicate sediment samples SED6/SED7	0852
7.	Photo of J. Jang collecting surface water sample SW8	0946
8.	Photo of J. Jang collecting surface water sample SW5	0959
9.	Photo of J. Jang collecting sediment sample SED5	1028
10.	Photo of J. Jang collecting surface water sample SW2	1054
11.	Photo of B. Pierre collecting surface water sample SW3	1118
12.	Photo of B. Pierre collecting sediment sample SED3	1127
13.	Photo of J. Jang collecting surface water sample SW4	1127
14.	Photo of B. Pierre collecting sediment sample SED4	1148
15.	Photo of J. Jang collecting surface water sample SW1	1330
16.	Photo of B. Pierre collecting sediment sample SED1	1342
17.	Photo of J. Jang collecting soil sample SL3	1404
18.	Photo of B. Pierre collecting soil sample SL2	1427
19.	Photo of J. Jang collecting soil sample SL1	1455



January 11, 1995 Photo of B. Pierre collecting surface water sample SW10.

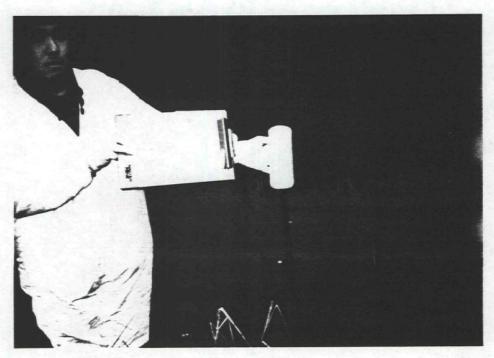




January 11, 1995
Photo of B. Pierre collecting sediment sample SED10.

08:05

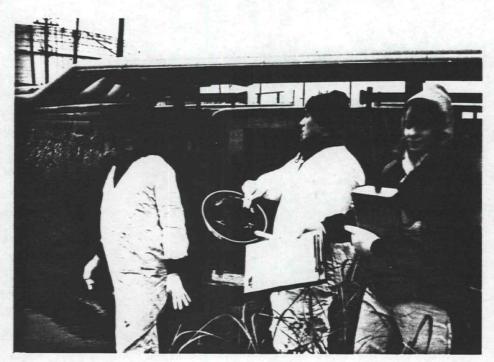
1.



January 11, 1995
Photo of J. Jang collecting surface water sample SW9.

3.





January 11, 1995 Photo of J. Jang collecting sediment sample SED9.

08:26



January 11, 1995
 Photo of J. Jang collecting duplicate surface water samples SW6/SW7.



January 11, 1995
Photo of B. Pierre collecting duplicate sediment samples SED6/SED7.



January 11, 1995
 Photo of J. Jang collecting surface water sample SW8.





January 11, 1995
Photo of J. Jang collecting surface water sample SW5.

09:59



January 11, 1995 Photo of J. Jang collecting sediment sample SED5. 10:28



January 11, 1995 Photo of J. Jang collecting surface water sample SW2. 10:54

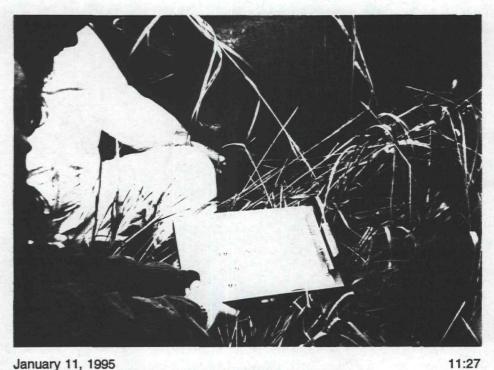
10.



January 11, 1995
 Photo of B. Pierre collecting surface water sample SW3.



January 11, 1995
Photo of B. Pierre collecting sediment sample SED3.

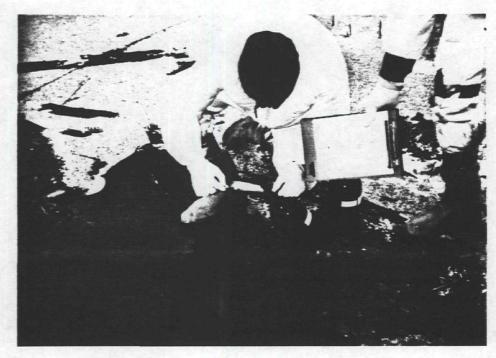


January 11, 1995
Photo of J. Jang collecting surface water sample SW4.



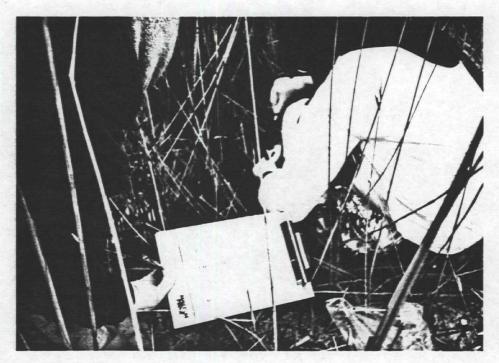
January 11, 1995 Photo of B. Pierre collecting sediment sample SED4.

14.



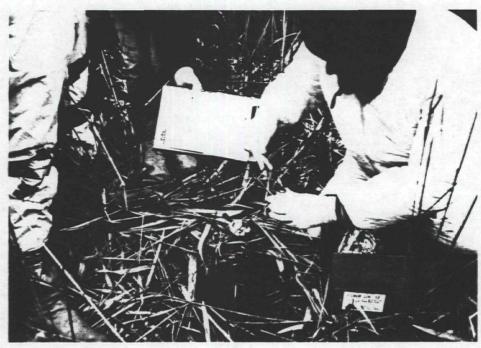
January 11, 1995
 Photo of J. Jang collecting surface water sample SW1.





January 11, 1995 Photo of B. Pierre collecting sediment sample SED1.

13:42



January 11, 1995 Photo of J. Jang collecting soil sample SL3.





January 11, 1995 Photo of B. Pierre collecting soil sample SL2.

14:27



January 11, 1995 Photo of J. Jang collecting soil sample SL1.

19.

14:55

**ATTACHMENT 2** 

Rev. No.: 1

#### REFERENCES

- U.S. Environmental Protection Agency (EPA) Superfund Program, Comprehensive Environmental Response Compensation Liability Information System (CERCLIS), List 8: Site/Event Listing, EPA Superfund Program, p. 280, March 15, 1993.
- Four-mile Vicinity Map for LCP Chemicals, Inc. site, compiled from U.S. Geological Survey Topographical Maps, 7.5 minute series, "Arthur Kill, New York-New Jersey," 1966, photorevised 1981; "Elizabeth, New York - New Jersey," 1967, photorevised 1981; "Perth Amboy, New Jersey," 1966, photorevised 1966"; "Roselle, New Jersey," 1955, photorevised 1981.
- Fifteen-mile Surface Water Pathway Map for LCP Chemicals site, compiled from National Wetland Inventory (NWI) Maps, "Arthur Kill, New Jersey-New York"; "Elizabeth, New Jersey-New York"; "Keyport, New Jersey"; "Perth Amboy, New Jersey"; "Roselle, New Jersey".
- 4. Project Note: To LCP Chemicals file, from David Kahlenberg, Malcolm Pirnie, Inc., Subject: Groundwater Apportionment, July 19, 1995.
- Project Note: To LCP Chemicals file, from David Kahlenberg, Malcolm Pirnie, Inc., Subject: Surface Water Pathway, May 10, 1995.
- Project Note: To LCP Chemicals file, from David Kahlenberg, Malcolm Pirnie, Inc., Subject: Wellhead Protection Areas, July 19, 1995.
- Project Note: To LCP Chemicals file, from David Kahlenberg, Malcolm Pirnie, Inc., Subject: Four Mile Radius Populations, May 10, 1995.
- 8. Project Note: To LCP Chemicals file, from Jin Ho Jang, Malcolm Pirnie, Inc., Subject: Four Mile Wetland Acreage, December 21, 1994.
- Hazard Ranking System, Final Rule 40, Code of Federal Regulations, Part 300, Federal Register Volume 55, No. 241 p. 51,601, December 14, 1990.
- 10. Supplemental Case Transfer Report, NJDEP, LCP Chemical site, July 26, 1991.
- 11. Evaluation and Site Inspection of LCP Chemicals-NJ, Inc., Linden, NJ, prepared for the EPA by Ertec Atlantic, Inc., Somerset, NJ, May 1982.
- Waste Lagoon Groundwater Monitoring Report, LCP Chemicals, New Jersey, Inc., Linden, NJ, prepared by Geraghty & Miller, Inc., February 1982.
- Site Inspection Report and Hazard Ranking System Model, LCP Chemicals, Linden, NJ, prepared by NUS Corporation, for the EPA, December, 31, 1984.
- Closure and Post-Closure Plan for Brine Sludge Lagoon, LCP Chemicals-NJ, Inc., Linden, NJ., July 16, 1982.

Rev. No.: 1

### **REFERENCES** (Continued)

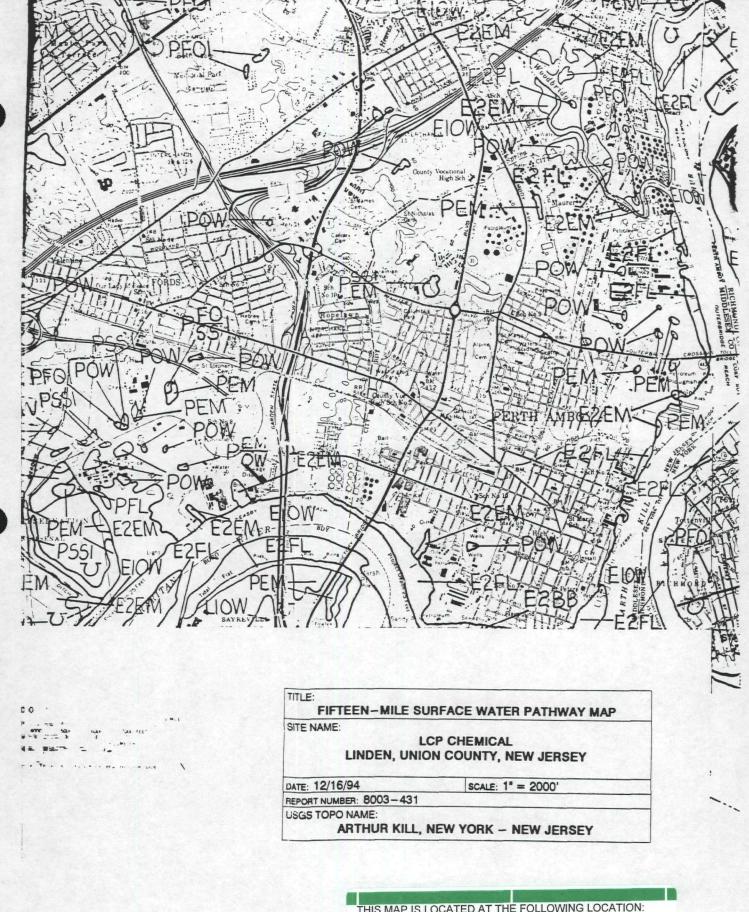
- Description of Current Conditions, RCRA Facility Investigation Task I, LCP Chemical NJ, Inc., Linden, NJ, prepared by Eder Associates Consulting Engineers, P.C. on behalf of LCP Chemicals - NJ, Inc., a Division of the Hanlin Group, Inc. for the EPA, January 1992.
- Sample Trip Report, LCP Chemical, EPA Case No. 23123, Site Inspection Sampling Event conducted on January 11, 1995.
- U.S. EPA Contract Laboratory Program, IT Analytical, Case No. 23123, Inorganic Laboratory Analysis from Malcolm Pirnie, Inc. Site Inspection Sampling, Conducted on January 11, 1995.
- Project Note: To LCP Chemical file, from David Kahlenberg, Malcolm Pirnie, Inc., Subject: Qualified Data, May 11, 1995.
- Field Notebook, No. 748212, LCP Chemical, Site Inspection Sampling, Malcolm Pirnie, Inc., January 11, 1995.
- Hazard Ranking System Guidance Manual, Office of Solid Waste and Emergency Response, USEPA, Publication No. 9345.1-07, November 1992.
- Interoffice Correspondence: to David Kahlenberg, from Lisa Greco, Subject: LCP Wetland Delineation, May 19, 1995.
- U.S. EPA Contract Laboratory Program, PACE New England (Resource Analytical), Case No. 23123, Organic/SemivolatileOrganic/Pesticides/PolychlorinatedBiphenylsLaboratoryAnalysisfromMalcolm Pirnie, Inc. Site Inspection Sampling, Conducted on January 11, 1995.
- Project Note: To LCP Chemical file, from David Kahlenberg, Malcolm Pirnie, Inc., Subject: Wetlands Actual Contamination, May 31, 1995.

REFERENCE NO. 1

	16/93   16:14:56 BASE DATE: 03/15/93		** PRU	D VERSIO		LEKHALD	DATA DASE	PAGE: 200
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**REFERENCE NO. 2** 

**REFERENCE NO. 3** 



THIS MAP IS LOCATED AT THE FOLLOWING LOCATION:

U.S. EPA, REGION 2, SUPERFUND RECORDS CENTER,
290 BROADWAY, 18<sup>TH</sup> FLOOR, NEW YORK, NY 10007

**REFERENCE NO. 4** 

To:File	Date: July 19, 1995
From:David Kahlenberg	Project #:8003-431
Subject: Groundwater Apportionment	Site Name: LCP Chemicals

The population within a four mile radius of the LCP Chemical site obtains its potable water from the following municipal water suppliers: Elizabethtown Water Company, the City of Rahway, Middlesex Water Company, and the City of New York.

Elizabethtown Water Company (EWC): The EWC distribution system currently blends water from five surface water intakes with water from 76 operating wells to provide water to 183,853 service connections. A total population of 498,241 (183,853 service connections x 2.71 people/household in Middlesex County) receives its drinking water from EWC. Surface water makes up roughly 85% of the total system flow with one of the intakes on the Raritan River providing more than 40% of the total system flow and the distribution system is completely interconnected. None of the surface water intakes utilized by EWC are located along the LCP Chemical surface water pathway. The Harrison Street Wellfield and St. Walburga Wellfield were identified within four miles of the site; however, EWC has closed these wells due to contamination.

Middlesex Water Company (MWC): Middlesex Water Company (MWC) utilizes 32 wells in conjunction with a surface water intake and water purchased from the Elizabethtown Water Company to supply potable water to approximately 52,000 service connections in the communities of South Plainfield, Metuchen, Carteret, Woodbridge, Edison and portions of Clark. A total population of 140,920 (52,000 service connections x 2.71 people/household in Middlesex County) receives its drinking water from Middlesex Water Company. Water is also provided via bulk transmission lines to the communities of Edison Township, Highland Park, Old Bridge MUA, Marlboro Township MUA and Sayreville. Although the system is interconnected in such a way that it is possible for water from any water supply unit to reach the bulk transmission lines, practically all of the water shipped in the bulk transmission lines originates from the surface water intake. The surface water intake accounts for 63.2% of the total system flow for MWC, wells account for 31.4%, and 5.4% is purchased from the Elizabethtown Water Company. The surface water intake utilized by MWC is not located along the LCP Chemical surface water pathway. In addition, none of MWC's groundwater wells are located within four miles of the LCP Chemical site.

<u>City of Rahway:</u> The City of Rahway operates a blended distribution system consisting of a surface water intake located on the Rahway River and one groundwater well (Well #6) to provide potable water to approximately 25,325 people. The groundwater well is not located within four miles of the site and the surface water intake is not located on the LCP Chemical surface water pathway.

<u>City of New York (CNY):</u> The CNY distribution system provides potable water to the population in the City of New York and Staten Island from the New York State Reservoir System located in upstate New York. The surface waters (reservoirs) associated with this water supply system are not located along the LCP Chemical surface water pathway.

Table 6. Household, Family, and Group Quarters Characteristics: 1990

rie				nily households		State of the state of					Persons per—		Persons in group quarters	
unty						Ta Lin	House	holder living	olone					
sce and [In Selected tates] County ubdivision	Persons in	All house-		Married- couple	Female house- holder, no husband			65 years	and over				Institu-	Other pe
ODGIVISION	households	holds	Total	family	present	Total	Total	Total	Female	Household	Family	Total	persons	quarte
The State	7 558 820	2 794 711	2 021 346	1 578 702	338 455	773 345	646 171	273 736	213 511	2.70	3.21	171 368	92 470	78 69
INTY  nnc County	218 321	85 123	56 576	'41 202	11 647	28 547	22 666	9 598	7 302	2.56	3.13	6 006	3 014	2 99
en County	816 230 380 910	308 880 136 554	225 188 104 190	186 258 85 741	29 139 14 015	83 692   32 364	71 606 26 746	30 959 9 309	7 303	2.64 2.79	3.14	9 150 14 156	5 485 7 068	3 6d 7 0d
den County	493 933 92 414	178 758 37 856	129 568 25 667	96 405 20 592	26 205 3 882	49 190   12 189	41 328 10 406	16 352 5 510	12 633	2.76	3.28	8 891 2 675	6 812	2 0
beriand County	131 455	47 118	34 966	25 318	7 429	12 152	10 191	5 060 30 077	3 961 23 011	2.79	3.24	6 598	6 047 8 353	10 2
x County	759 590 225 971	278 752 78 845	191 363 60 808	124 659	53 401 8 453	87 389 1 18 037	14 875	5 940	4 586	2.87	3.30	4 111	1 712	2 3
son County	546 160 104 438	208 739 37 906	136 143	90 508 25 953	34 343   2 371	72 596 8 611	59 931 6 770	22 921	17 406	2.62	3.26	6 939	3 561 3 260	3 3
cer County	309 804	116 941	82 447	62 715	15 448	34 494	28 277	11 589	8 976	2.65	3.16	16 020	5 803	10 2
mouth County	541 950	238 833 197 570	175 451	143 344	23 886 19 442	63 382 51 678	50 903 43 434	19 029 19 373	14 955 15 332	2.71	3.18	23 669	7 926 5 904	15 7
ms County	413 680	148 751	113 074	96 850	11 923	35 677	28 312	9 742	7 749	2.78 2.54	3.21	7 673	4 164	3 5
an County	426 852 442 797	168 147 155 269	120 783	102 028 84 917	14 443	47 364	41 879 33 677	27 121 15 585	21 674 12 133	2.85	3.33	6 351	4 529 5 321	4 9
en County	63 765 235 585	23 794 88 346	17 645	13 780 55 575	3 017 7 231	6 149	5 329 18 182	2 579 5 351	1 924	2.68	3.15	1 529	1 337	
sex County	129 218	44 456	35 516	30 810	3 379	8 940	7 193	2 768	2 167	2.91	3.29	1 725	1 443	
on County	487 238 90 398	130 074 33 997	25 011	20 807	3 090	8 986	41 475 7 551	19 046	14 963 2 732	2.71	3.19	6 581	3 884 784	2
ACE AND COUNTY SUBDIVISION														
econ city Atlantic County	16 896 7 144	5 905 2 579	4 617	3 873	555 262	1 288   570	1 038	250	185	2.86	3.27	142	129	
kanana township Munterdon County	3 531	1 203	1 016	922	65	. 187	146	55	35	2.94	3.21	63	63	
muchy township. Warren County muchy-Panther Valley CDP, Warren	3 448	1 471	1 033	904	99	438	371	97	77	2.34	2.81	36		
unity	2 728 5 709	1 232	1 603	750 1 439	72 128	389 256	332 197	82	65 59	2.21 3.07	2.69 3.31	36	191	
nhurst borough, Monmouth County	759	298	208	174	27	90	79	38	· 28	2.55	3.11	-	-	
ntown borough, Monmouth County	1 828	655 473	382	427 329	73 37	136	107	26	21 33	2.82	3.13	36	36	
way township, Salem County	2 759	956	774	664	80	182	162	81	51	2.89	3.24	36	36	
ne borough, Warren County	2 530 1 716	967 534	729	590 442	110	238	199	104	87 15	2.62 3.21	3.03	1	- 1	
over borough, Sussex County	700	261	181	149	24	80	61	15	15	2.68	3.23	1	-	
lover township, Sussex County	1 074	1 695	1 337	1 162 262	126	358	280 74	81	28	2.80	3.16 3.16	691	679	
oury Park city, Monmouth County	16 277 36 225	6 871 15 731	3 584 8 183	1 662 3 713	1 611 3 584	3 287 7 548	2 836 6 391	1 357 3 022	1 075	2.37	3.28	1 761	28 934	
antic Highlands borough, Monmouth										The state of the s				
Subon borough, Camden County	4 629 9 205	1 774 3 622	1 267 2 433	1 021	181 373	1 189	1 031	186	142	2.61	3.11	-		
lubon Park borough, Camden County	1 150	498		237	92	152	143	135	81	2.31	2.83			
Mon borough, Cape May County	1 809	838 4 854		2 719	524	1 434	1 200	400	280	2.52	2.68 3.02		3 261	
on-by-the-Sea borough. Monmouth County_ megat CDP. Ocean County	2 141	989 424		447 248	90 47	113	384	200	159	2.16	2.94 3.22	24		
megat township. Ocean County	12 120	4 163	3 343	2 838	389	820	695	372	277	2.91	3.29	115	115	
megat Light borough, Ocean County	657	330 2 688		1 499	19 295	132 825	121	235	37 172	1 99 2.52	2.55 3.08	18	-	
ss River township. Burlington County	1 580	554 530	435	361	56 59	119	98	73	38 51		3.25	-	-	
yonne aty. Hudson County	61 191	25 309		293 11 956	3 475	8 781	7 955	3 958	3 084		3.06	253		
och Haven borough. Ocean County	1 460	659		344	61	238	206	1112	90		2.78	15	-	
och Haven West CDP Ocean County	9 324	1 832 3 047	1 286	1 090 2 035	339	546	475	193	129	3.06	2.76 3.42			
attyestown CDP. Warren County	3 966 3 815	1 679		880 950	148	602	107	81 7	61	2.36 3.21	2.94 3.46		:	
dminster township. Somerset County	7 086	3 447	1 991	1 654	272	1 456	1 225		94	2.06	2.66	-	-	
leville CDP. Essex County	34 123 34 123			6 964	1 637	4 181	3 575			2.55	3.13			
mawr borough, Comden County	12 603 5 851	4 679	3 531	2 732	010	1 148	968	1 404	307		3.13		у -	
videre town Warren County	A COUNTY OF THE PARTY OF THE PA	1 027		1 009	265 100	299	247	113	96		3.09	6		
rgenheld borough, Bergen County	24 417	8 799	6 733	5 462	932	2 066	1 741	919	729	2.77	3.21 2.50			
rkeley township. Ocean County	36 794 11 540			11 076 3 017	997 220	5 220 535	414	181	129	2.99	3.22	440	402	
rkeley Heights CDP. Union County	11 540		3 325	3 017 1 265	220 179	535	373		129		3.22		402	
rlin township, Camden County	5 453	1 777	1 432	1 151	202	345	275	97	72	3.07	3.42	13		
mards township, Somerset County mardsville borough, Somerset County	16 146	2 449		4 160		1 737	1 432	202	163	2.67	3.02			
hiehem township, Hunterdon County	3 104	1 033	882	803	51	151	115	A STATE OF THE PARTY OF THE PAR	29	3.00	3.26		-	
verty city. Burlington County	2 973			1 098	197 211		207 374				3.42		- :	
prestown township. Warren County	5 331	1 773	1 474	1 328	112	299	251	128	90	3.01	3.33	-	-	
comfield CDP Essex County	44 633	18 455	11 857	9 258 9 258	1 970	6 598	5 675	2 490	1 993	2.42	3.07	428		
comingdale borough, Passaic County	7 530	2 747	2 094	1 763 227	248		507	169			3.15			
gota borough, Bergen County	7 811	2 777	2 079	1 674	312	698	582	213	169	2.81	3.31	13		
onton town Morns County	8 198			1 665			185			2.63	3.15			
rdentown city. Burlington County	4 297	1 784	The second second	809	258	636	543	205	149	2.41	3.02	44		
ordentown township. Burlington County and Brook borough, Somerset County	7 334	2 857	2 024	1 683	256	833	678	207	154		3.08			
adley Beach borough, Monmouth County	4 465	2 009	1 086	778	230	923	731	248	198	2.22	2.96	10	-	
anchburg township. Somerset County anchville borough, Sussex County	851	354				1 113	522	52	40	2.40	3.23	-		
oss Costle CDP Warren County	1 419	47	7 403	374	17	74	67	44	31	2.97	3.28	-	286	
ick Township CDP Ocean County	66 170			15 810 15 810		6 236	5 338	2 855			3.10		286	
				12 010	4 447									

File No.

8003-431

Date:

December 14, 1994

Time: 1:10 AM [] PM []

Incoming Call

From:

Richard Sadowski

908-694-1234

Telephone No.

Affiliation:

Elizabethtown Water Co.

Malcolm Pirnie Staff: Christopher Bath

(609) 860-0100

Telephone No.

Summary of Conversation:

Mr. Sadowski related the following information. The Harrison Street Wellfield and the St. Walburga Wellfield are closed due to contamination.

File No.

8003-454

Date:

June 13, 1995

Time: 2:05 AM [] PM [X]

Outgoing Call

To:

Richard Sadowski

(908) 654-1234

Telephone No.

Affiliation:

Elizabethtown Water Company

Malcolm Pirnie Staff: Andrew Clibanoff

(609) 860-0100

Telephone No.

Summary of Conversation:

I called Mr. Sadowski to confirm information gathered for the Cornell Dubilier Electronics, Inc. Site at the Site Inspection Prioritization stage back in February 1994. Mr. Sadowski stated that there have been no significant changes in Elizabethtown Water Company's water supply and distribution system in the past 1.5 years. There are 183,853 service connections in the water company's distribution system. There are approximately 72 active wells being utilized. All of the wells within four miles of the Cornell Dubilier Electronics, Inc. site that were in use in February 1994 are currently still in use. Mr. Sadowski stated that 85% of the total system flow is provided by the surface water intake with the remaining 15% provided by the wells. Mr. Sadowski was unsure if any single surface water intake provides more than 40% of the total system flow. He recommended that I call Jim Cowley at the treatment plant (same phone number as above) for more information about the intakes.

File No.

8003-454

Date:

June 15, 1995

Time: 9:05 AM [X] PM []

Incoming Call

From:

Jim Cowley

(908) 654-1234

Telephone No.

Affiliation:

Elizabethtown Water Company

Malcolm Pirnie Staff: Andrew Clibanoff

(609) 860-0100

Telephone No.

### Summary of Conversation:

Mr. Cowley returned my phone call from earlier in the week. I called Mr. Cowley to gather information about the Elizabethtown Water Company's surface water intakes. Mr. Cowley indicated the water company has three intakes located on the Raritan River, one intake on the Delaware and Raritan Canal, and one intake on the Millstone River. All five of the intakes are located in the vicinity of the confluence of the Raritan and Millstone Rivers. The intake located on the Millstone is a standby intake that was never used this past year. Water from the intakes is pumped to a water treatment plant. An average total of 120 million gallons per day (MGD) of water is treated at the plant. Of that total, 84 MGD is pumped via two 66 inch lines located side by side on the Raritan River. Eighteen MGD is pumped from the remaining intake on the Raritan River and the remaining 18 MGD is pumped via a 54-inch line located on the Delaware and Raritan Canal. Mr. Cowley stated that the Elizabethtown Water Company does not keep records of how much each of the 66inch lines pumps individually. The two lines are thought of as one intake by the company. However, Mr. Cowley indicated that the newer of the 66-inch lines provided the majority of the water. Mr. Cowley could not say for sure whether the new 66-inch line provides more than 40% of the total flow in the distribution system.

File No.

8003-454

Date:

June 19, 1995

Time: 9:05 AM [X] PM []

**Incoming Call** 

From:

Jim Cowley

(908) 654-1234 Telephone No.

Affiliation:

Elizabethtown Water Company

Malcolm Pirnie Staff: Andrew Clibanoff

(609) 860-0100

Telephone No.

Summary of Conversation:

I called Mr. Cowley for the capacities of the five intakes owned by the Elizabethtown Water Company. Capacities for the intakes are shown in the table below:

Intake	Capacity (MGD)	
2 - 66-inch Raritan River Intakes	140	
54-inch Raritan River	40	
Delaware and Raritan Canal	40	
Millstone*	25	

<sup>\*</sup> The Millstone River intake is a standby intake that has not been used during the past year.

File No.

8003293

Date:

February 24, 1994

Time: 9:30 AM [x] PM []

Outgoing Call

To:

Richard Sadowki

(908)654-1234 Telephone No.

Affiliation: Elizabethtown Water Company

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

I called to verify existing information Malcolm Pirnie has on file. Mr. Sadowski confirmed no wells were located in Linden, Carteret, Rahway, or Woodbridge. Elizabethtown has a total of 131 wells. Mr. Sadowski indicated he would fax a copy of the 1992 territory served tabulation.

DURING YEAR -- DECEMBER 1992

. 161	omn (b) should show the estimated permanent population at end of year for area served. here was a significant change in population for summer mouths use two lines for the municip	athy involved indicates	a "permanent" and he	mmer*		DKC .	REPORT
t. 1 N H	NAME OF MUNICIPALITY OR OTHER POLITICAL SUBDIVISION  (4)	ESTIMATED PERMANENT POPULATION SERVED (b)	NO. OF CUSTOMERS END OF YEAR (4)	NO. OF FIRE HYDRANTS (4)	TOTAL.	ON PUBLIC WAYS	ON PRIVATE RIGHT OF WAY (8)
	Bedminster	222	74	25	50,055	43,982	6.0
2	Bound Brook	8.148	2.717	134	142,013	130,565	11.44
3	Branchburg	7,920	2.640	371	297,985	283,606	14.3
4	Bridgewater	25.785	8,596	906	929,327	769,036	160.29
5	Clark	14.811	4,937	331	342,221	306,770	35.45
6	Chester .	57	19	7	8.676	8.676	
7	Cranbury	15	5	25	30.767	23.714	7,03
	Cranford	22,851	7,617	472	439,254	424.858	14,39
9	Dunellen	6.525	2,175	104	101,941	100,570	1.3
0	Edison	4,065	1.355	175	166,266	112,537	53.7.
1 4			edition in		239	239	
2	Fanwood	7,644	2.548	145	157,760	152.614	5,1
1				1	3.240		3,2
1	Franklin	675	225	42	55.633	53,782	1.8
5	Garwood	. 4,635	1,545	86	68,878	66,771	2.1
4	Greenbrook	3.813	1.271	145	160,199	146,465	13.7
7	Hilkhorough	19,932	6.644	854	685,688	535,399	150,2
	Hillside	18,069	6,023		285,517	276,086	9.43
	Kenilworth	9,156	3.052	166	177.995	166,015	11.9
0	L.awrence	3.657	1,219	151	137,864	97.217	40.62
	Linden	34,191	11.400	25	729,083	628,705	100.3
	Middlesex	13.029	4.343	274	301.052	278.668	22,38
,	Millstone	234	78	11	11.143	11,143	160
	Montgomery	4,245	1.415	375	318,633	267,075	51.55
-	Mountainside	7.614	2,538	206	245.556	229,275	16.28
		1			348	348	
-	Peapack Gladstone	1 2,049	683	104	94.927	90,232	4.69
	NorthPlainfield	14.865	4.955	310	272.374	255,815	16,55
1	Piscataway	30,291	10.098	727	938,5351	829,435	109.10
-	Plainfield	31,200	10.400	704	576.657	564,856	11.80
	Plainshoro	7.587	2,529	381	316,883	176,733	140.15
2	Princeton Borough	7.173	2,392	194	206,376	181,370	25.00
,	Princeton Township ;	12.849	4.343	510	529,920	461.826	68.09
4		1		1.	12.062	7.188	4.87
5	Raritan Borough	··· 6.090	-, 2.030	1 125	32.092	! 124,553	7.53
A	Raritan Township	1714 17.461		217	208.454	164,001	44,453

100088

**Total Soumer Population Only** 

100089

1. Column (b) shorts enow the estimated permunent population at end of year for area	sorved
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L		PSTIMATED PERMANENT			PERT OF MAINS				
N	NAME OF MUNICIPALITY OR OTHER POLITICAL SUBDIVISION  (*)	PERMANENT POPULATION SERVED (3)	NO. OF CUSTOMERS END OF YEAR (4)	NO. OF PTRB INTERNITS (4)	TOTAL (e)	ON PUBLIC WAYS	ON PRIVATE REGILT OF WAY		
!	Readington	1.260	420	59	86,040	68,270	17,77		
2	Remelle	16.143	5,381	356	256.407	250,675	5.73		
3	Roselle Park	10,401	3.467	157	170,513	167,638	2.87		
1	Scotch Plains	21,174	7,058	451	568,676	522,412	46.26		
5	Somerville	10.470	3,490	200	238,510	195,205	43,30		
6	South Bound Brook	3.624	1.208	71	64,100	59,062	5.03		
7	South Brunswick	618	206	18	19,684	15,537	4,14		
	South Plainfield	11.184	3,728	342	362,328	317,931	44,39		
9				8	10,338	2,613	7.72		
10	Tewksbury	309	103	18	11,850	11.232	61		
11	Union	49.770	16,591	19	913,620	863,824	49,79		
12	Warren	6,333	2,111	419	349,573	335,971	13,60		
13	Watchung	3,864	1,288	242	206,361	189,449	16,91		
14	Westfield	29,391	9,797	693	630,003	610,973	19,03		
15	West Windsor	14,124	4.708	661	621,709	554,911	66.79		
16			Felme Strike Rail	. 4	19,784	14,594	5,19		
17				Property of the second	12,948	8,776	4.17		
18									
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11			The second						
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7	Total Semmer Population Only								

## ELIZABETHTOWN WATER COMPANY WELL LIST

Town	County	Facility Name	Well Depth	Well Permit Number	Effective Date	Formation	Pump Cap. (GPM)	Motor HP	Туре	
Bound Brook	Somerset	Mountain Sta. #1	366				750	60	Turbine	
Bound Brook	Somerset	Mountain Sta. #2	404				356	40	Turbine	
Bridgewater	Somerset	Papen Road	225	25-13435	7/12/83	Basalt	220	40	Turbine	
Bridgewater	Somerset	Wells Road #1	130	25-5803	7/12/83	Basalt	75	10	Turbine	
Bridgewater	Somerset	Wells Road #2 .	130	25-11512	7/12/83	Basalt	75	10	Turbine	
Clark	Union	Elks Well	59	26-4751	7/12/83	Brunswick	300	30	Turbine	
Green Brook	Somerset	Green Brook #1	451	45-23	6/7/83	Brunswick	310	25	Turbine	
Green Brook	Somerset	Green Brook #2	376	45-24	6/7/83	Brunswick	650	50	Turbine	
Green Brook	Somerset	Green Brook #3	550	45-25	6/7/83	Brunswick	60	7.5	Submersible	
Green Brook	Somerset	Green Brook #4	400	45-26	6/7/83	Brunswick	350	30	Turbine	
Green Brook	Somerset	Green Brook #5	373	25-572	6/7/83	Brunswick	315	25	Turbine	
Green Brook	Somerset	Green Brook #6	373	25-632	6/7/83	Brunswick	278	25	Turbine	
Green Brook	Somerset	Green Brook #7	238	25-633	6/7/83	Brunswick	179	15	Turbine	
Green Brook	Somerset	Green Brook #8	445	25-2715	6/7/83	Brunswick	495	40	Turbine	
Green Brook	Somerset	Green Brook #9	507	25-2716	6/7/83	Brunswick	500	50	Turbine	
Green Brook	Somerset	Green Brook #11	510	25-2718	6/7/83	Brunswick	340	25	Submersible	
Green Brook	Somerset	Rock Avenue	350	25-12665	6/7/83	Brunswick	330	40	Submersible	
Kenilworth	Union	Quinton Avenue	502	46-14	7/31/83	Brunswick	185	40	Turbine	
Kenilworth	Union	Richfield Avenue	401	46-15	7/31/83	Brunswick	250	30	Turbine	
Middlesex	Middlesex	Sebrings Mill #4	300	25-11582	8/17/84	Brunswick	200	25	Submersible	
Middlesex	Middlesex	Sebrings Mill #6	412	45-43	8/17/84	Brunswick	400	40	Submersible	
Middlesex	Middlesex	Sebrings Mill #7	285	25-11367	8/17/84	Brunswick	300	30	Submersible	
Middlesex	Middlesex	Sebrings Mill #8	430	25-13397	8/17/84	Brunswick	200	25	Submersible	
Montgomery	Somerset	Montgomery #1	305	28-5407	6/7/83	Stockton	450		Submersible	
Montgomery	Somerset	Montgomery #2	335	28-5511	6/7/83	Stockton	450		Submersible	
Mountainside	Union	Bristol Road	315	25-9206	6/7/83	Brunswick	330	40	Submersible	
Mountainside	Union	Central Avenue	300	25-9083	6/7/83	Brunswick	475	60	Submersible	
Mountainside	Union	Charles Street #1	454	25-872	6/7/83	Brunswick	300	40	Submersible	
Mountainside	Union	Charles Street #2	572	45-4	6/7/83	Brunswick	150	25	Submersible	
N. Plainfield	Somerset	Board of Education	311	45-22	6/7/83	Brunswick	400	50	Turbine	
N. Plainfield	Somerset	Rockview Avenue	400	25-13898	6/7/83	Brunswick	300		Submersible	
N. Plainfield	Somerset	Rockview Terrace	400	25-13106	6/7/83	Brunswick	200	25	Submersible	
Piscataway	Middlesex	Rock Avenue	350	25-13248	6/7/83	Brunswick	150	20	Submersible	
Plainfield	Union	Fifth Street	350	25-12961	6/7/83	Brunswick	300	40	Submersible	
Plainfield	Union	George Street	89	45-21	6/7/83	Brunswick	125	20	Turbine	
Plainfield	Union	Netherwood #1	350	45-9	6/7/83	Brunswick	225	20	Turbine	
Plainfield	Union	Netherwood #2	500.	45-10	6/7/83	Brunswick	225	20	Turbine	
Plainfield	Union	Netherwood #3	350	45-11	6/7/83	Brunswick	600	25	Submersible	
Plainfield	Union /	Netherwood #4	400	45-12	6/7/83	Brunswick	400	15	Turbine	
Plainfield	Union 7)/	Netherwood #5	350	45-13	6/7/83	Brunswick	300	15	Submersible	
Plainfield	Union 2	Netherwood #6	300	45-14	6/7/83	Brunswick	325	20	Turbine	
Plainfield	Union )	Netherwood #7	350	45-15	6/7/83	Brunswick	350	25	Submersible	
Plainfield	Union	Netherwood #8	304	45-16	6/7/83	Brunswick	300	25	Submersible	
Plainfield	Union	Netherwood #9	350	45-17	6/7/83	Brunswick	300	30	Submersible	
Plainfield	Union	Netherwood #10	350	45-18	6/7/83	Brunswick	300	25	Submersible	
Plainfield	Union	Netherwood #11	350	45-19	6/7/83	Brunswick	250	20	submersible	
Plainfield	Union	Netherwood #12	352	45-20	6/7/83	Brunswick	250		Turbine	
Plainfield	Union	City of Plainfield	300	45-27	6/7/83	Brunswick	400	50	Turbine	
Plainfield	Union 4-	Prospect Avenue	350	25-9037	6/7/83	Brunswick	300	40	Submersible	
Plainfield	Union 5	Watchung Avenue	605	25-8185	6/7/83	Brunswick	280	30	Submersible	
Plainsboro	Middlesex	Plainsboro #1	120	28-9278	7/12/83	Raritan	350		Turbine	
Plainsboro	Middlesex	Plainsboro #2	208	28-11477	7/12/83	Raritan	295		Turbine	
Princeton	Mercer	Edgerstoune		28-5000	7/12/83	Stockton	125		Turbine	

lown	County	Facility Name	Well Depth	Well Permit Number	Effective Date	Formation	Pump Cap. (GPM)	Motor HP	Туре
Princeton	Hercer	Grover Avenue	439	28-2607	7/12/83	Raritan	100		Turbine
rinceton	Mercer	Harrison Street #1	503	48-5	7/12/83	Stockton	100	20	Submersible
rinceton	Hercer	Harrison Street #3	301	28-4371	7/12/83	Stockton	100	65	Turbine
Princeton	Mercer	Harrison Street #4	302	48-6	7/12/83	Stockton	110	20	Turbine
rinceton	Mercer	Harrison Street #5	320	48-7	7/12/83	Stockton	150	20	Turbine
rinceton	Mercer	Harrison Street #6	335	28-1886	7/12/83	Stockton	400	50	Turbine
rinceton	Mercer	Harrison Street #7	300	28-4999	7/12/83	Stockton	200	15	Submersible
rinceton	Mercer	Harrison Street #8	347	28-5073	7/12/83	Stockton	400	40	Submersible
rinceton	Mercer	Stony Brook #2	279	48-8	7/12/83	Stockton	300	40	Turbine
rinceton	Hercer	Stony Brook #3	353	48-9	7/12/83	Stockton	500	30	Turbine
rinceton	Mercer	Stony Brook #4	382	48-10	7/12/83	Stockton	300	15	Submersible
rinceton	Mercer	Stony Brook #6	304	48-11	7/12/83	Stockton	450	40	Turbine
rinceton	Mercer	Stony Brook #7	350	48-12	7/12/83	Stockton	600	25	Submersible
rinceton	Mercer	Stony Brook #8	302	48-13	7/12/83	Stockton	600	40	Turbine
aritan Township	Hunterdon	Maple Glen	355		.,		250	15	Submersible
loselle	Union	Chandler Avenue	350	26-2393	7/31/83	Brunswick	300	30	Submersible
loselle	Union	First Avenue	509	26-1696	7/31/83	Brunswick	450	50	Turbine
loselle	Union	Walburga #1	350	26-2302	7/31/83	Brunswick	200	40	Submersible
loselle	Union	Walburga #2	348	26-2360	7/31/83	Brunswick	200	60	Submersible
loselle	Union	Walburga #3	321	26-2412	7/31/83	Brunswick	350	40	Submersible
oselle	Union	Walburga #4	321	26-2463	7/31/83	Brunswick	300	50	Submersible
cotch Plains	Union 3-	Aberdeen Road	350	25-12631	6/7/83	Brunswick	250	30	Submersible
cotch Plains	Union	Glenside Avenue	540	25-7173	7/12/83	Brunswick	150	20	Turbine
cotch Plains	Union	Jerusalem Road #1	650	25-130	7/12/83	The second of th	275	30	Turbine
		Jerusalem Road #2	665	25-649	7/12/83	Brunswick Brunswick	350	30	Turbine
cotch Plains	Union		708	25-800			150	15	Turbine
cotch Plains	Union 6-	Jerusalem Road #3 Morse Avenue		25-9281	7/12/83	Brunswick			
cotch Plains			400		7/12/83	Brunswick	295	30	Submersible
outh Plainfield		Clinton Avenue	350	25-13354	6/7/83	Brunswick	475	50	Submersible
outh Plainfield	Middlesex	Eighth Street	350	25-12632	6/7/83	Brunswick	450	50	Submersible
pringfield	Union	Springfield #1		46-39	7/12/83	Brunswick	50	3	Submersible
pringfield	Union	Springfield #1A		46-40	7/12/83	Brunswick	100	7.5	Turbine
pringfield	Union	Springfield #2					150	7.5	Submersible
pringfield	Union	Springfield #2A		46-41	7/12/83	Brunswick	100	7.5	Turbine
pringfield	Union	Springfield #3		26-4082	7/12/89	Brunswick	300	7.5	Turbine
pringfield	Union	Springfield #4						10	Turbine
pringfield	Union	Springfield #5						10	Turbine
pringfield	Union	Springfield #5A		46-42	7/12/83	Brunswick	75	5	Turbine
pringfield	Union	Springfield #6		26-4082	7/12/83	Brunswick	160	7.5	Submersible
pringfield	Union	Springfield #6A		46-43	7/12/83	Brunswick	300	7.5	
pringfield	Union	Springfield #7		46-44	7/12/83	Brunwsick	100		
pringfield	Union	Springfield #7A		46-45	7/12/83	Brunswick	75	7.5	Turbine
pringfield	Union	Springfield #8R		46-46	7/12/83	Brunswick	100	10	Submersible
pringfield	Union	Springfield #9R		46-47	7/12/83	Brunswick	200	7.5	Turbine
pringfield	Union	Springfield #11		46-48	7/12/83	Brunswick	125	7.5	Submersible
pringfield	Union	Springfield #12R		<b>"一种"</b>					
pringfield	Union	Springfield #17							
pringfield	Union	Springfield #21R		46-50	7/12/83	Brunswick	150 .	5	Turbine
pringfield	Union	Springfield #23			.,,	D. CHIONIUN	50	5	Turbine
pringfield	Union	Springfield #24		46-51	7/12/83	Brunswick	60	3	Submersible
Springfield	Union	Springfield #25		10 31	1712/03	DI CHISHICK	100	10	Turbine
pringfield	Union	Springfield #29					100	5	Submersible
Springfield	Union	Springfield #32					100		GLAMICI STOLE
Springfield	Union	Springfield #36		46-52	7/12/83	Brunswick	125	5	Submersible
Springfield	Union	Springfield #41		40-72	1/12/03	DICHISMICK	75	7.5	Submersible
Springfield	Union	Springfield #42		46-53	7/12/83	Brunswick	100	5	Submersible
bi indi ista	Union	Springfield #43		40-33	1/12/03	BIGHSWICK	100		Junier 3 lote
Springfield									

Town	County	Facility Name	Well Depth	Well Permit Number	Effective Date	Formation	Pump Cap. (GPM)	Motor HP	Туре
Springfield	Union	Springfield #47		46-54	7/12/83	Brunswick	125	5	Submersible
Springfield	Union	Springfield #48		46-55	7/12/83	Brunswick	75	5	Submersible
Springfield	Union	Springfield #50		46-56	7/12/83	Brunswick	50	5	Turbine
Springfield	Union	Springfield #53		46-57	7/12/83	Brunswick	175	7.5	Turbine
Springfield	Union	Springfield #54		46-58	7/12/83	Brunswick	150	7.5	Turbine
pringfield	Union	Springfield #55		46-59	7/12/83	Brunswick	175	7.5	Turbine
leuksbury	Somerset	Pottersville	400	25-15051	6/7/83	Pre-Cambria		30	Submersible
Inion	Union	Hummocks #1	326	46-16	7/12/83	Brunswick	100		
Inion	Union	Hummocks #1A	143	46-17	7/12/83	Brunswick	200		
Inion	Union	Hummocks #2A	122	46-18	7/12/83	Brunswick	150		
Jnion	Union	Hummocks #3	91	46-19	7/12/83	Brunswick	200		
Inion	Union	Hummocks #3A	126	46-20	7/12/83	Brunnwick	100		
Jnion	Union	Hummocks #4A*	117.5	46-21	7/12/83	Brunswick	70	5	Submersible
Inion	Union	Hummocks #5	92	46-22	7/12/83	Brunswick	200		
Inion	Union	Hummocks #5A*	128	46-23	7/12/83	Brunswick	100	7.5	Submersible
Jnion	Union	Hummocks #6AR*	130	46-24	7/12/83	Brunswick	300	20	Turbine
Inion	Union	Hummocks #7A*	233	46-25	7/12/83	Brunswick	85	5	Submersibl
Inion	Union	Hummocks #8A*	114	46-26	7/1/83	Brunswick	200	10	Turbine
Inion	Union	Hummocks #9A	126	46-27	7/12/83	Brunswick	150		
Inion	Union	Hummocks #10	84	46-27	7/12/83	Brunswick	100		
Inion	Union	Hummocks #10A	118	46-29	7/12/83	Brunswick	150		
Inion	Union	Hummocks #11A	125	46-30	7/12/83	Brunswick	100		
Inion	Union	Hummocks #12A	120	46-31	7/12/83	Brunswick	200		
Jnion	Union	Hummocks #17*	99.6	46-32	7/12/83	Brunswick	250	15	Submersibl
Inion	Union	Hummocks #19	455	46-33	7/12/83	Brunswick	100		
Inion	Union	Hummocks #23	120	46-34	7/12/83	Brunswick	100		
Inion	Union	Hummocks #26		46-35	7/12/83	Brunswick	100		
Inion	Union	Hummocks #28	96	46-36	7/12/83	Brunswick	100		
nion	Union	Hummocks #29	92	46-37	7/12/83	Brunswick	100		
nion	Union	Hummocks #41	83	46-38	7/12/83	Brunswick	150		10.40
nion	Union	Hummocks #H2*		26-4830	7/12/83	Brunswick	150		Turbine
nion	Union	Hummocks #H5		26-4926	7/12/83	Brunswick	220		
nion	Union	Hummocks #TB2		26-4808	7/12/83	Brunswick	200		
nion	Union	Hummocks #TB2A		26-4829	7/12/83	Brunswick	400	J. 1941	7 4 4 5 1
atchung	Somerset	Two Guys #1	325	25-8131	6/7/83	Brunswick	400	40	Submersib!
atchung	Somerset	Two Guys #2	350	25-8132	6/7/83	Brunswick	60	20	Submersible
estfield	Union 7	Elm Street	525	25-8087	7/12/83	Brunswick	350	40	Submersible
estfield	Union 5	- Prospect Street	500	25-12960	7/12/83	Brunswick	150	20	Submersible
estfield	Union	Westfield Office #1	523	25-873	7/12/83	Brunswick	500	50	Turbine
lestfield	Union	Westfield Office #2	502	45-5	7/12/83	Brunswick	350	40	Turbine
lestfield	Union	Wittke #1	506	25-4639	7/12/83	Brunswick	425	50	Turbine
lestfield	Union	Wittke #2	511	25-5083	7/12/83	Brunswick	525	75	Turbine
lest Windsor	Mercer	Jefferson Park #1	121	28-5368	6/7/83	Raritan	600		Turbine
lest Windsor	Mercer	Jefferson Park #2	126	28-6455	6/7/83	Raritan	600		Turbine
Only wells in	service with	new V.O.C. facility							

### SERVICE TO OTHER SYSTEMS --- INFORMATION LIST

Interconn. With:	Drw.	Interconn. Location:	Flow Direction:	Type of Interconn.	Meter Size:	Contracted Consumption:	Contract Expires:	Facility Number:	Book Map:	Contact Personnel:
Edison Twp	1	Talmadge Rd - Edison Twp Line	From	Normal	16" Venturi	4.5 mgd	1/1/98	3518	H-12	1) Matt Bolger
Water Dept.	2	Truman Dr Edison Twp Line	From	Normal	20" Venturi		11	3516	H-14	2) Pete Schnattauf
	3	Stelton Rd - Edison Twp Line	From	Emergency	8"			3517	H-14	(office) 287-0900 3) Police/24 hrs 287-1900
Elizabeth Water	4	Morris Avenue	From	Normal	20" Venturi	5.0 mgd	1/1/92	3528	A-5	24 hrs/820-4108
Department	5	Lidgerwood Avenue	From	Normal	16" Venturi		86	3526	A-6	1) Bill Connelly
	- 6	Westfield - Galloping Hill Rd.	From	Normal	8"	н		3534	B-6	2) Roger Kilgore
	7	Brunswick Ave. & Allen St.	To	Emergency	8"	н .		3504	A-7	3) Kevin Glacken
	-8	Waterfront & Kohler Way	From	Normal	6"	u u		3532	A-7	
	-9	Clay Ave - Galloping Hill Rd.	From	Normal	6"			3524	B-5	
	10	Salem Ave Galloping Hill Rd.		Emergency	6"		н	3536	A-4	



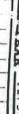


### TERRITORY SERVED DURING YEAR

1. Column (b) should show the estimated permanent population at end of your for area served.

2. If there was a significant change in population for summer months use two lines for the municipality involved indicating "permanent" and "summer".

		ESTIMATED			FELT OF MAINS				
1	NAME OF MUNICIPALITY OR OTHER POLITICAL SUBDIVISION  (a)	PERMANENT FORM.ATION SERVED (b)	NO. OF CUSTOMERS END OF YEAR (c)	NO. QF FIRE HYDRANTS (d)	TOTAL (*)	PUBLIC WAYS	ON PRIVATE RIGHT OF WA		
1	Bedminster	222	74	26	50,055	43,982	6,073		
2	Bound Brook	8,085	2,695	132	140,551	129,103	11,448		
8	Branchburg ·	6,711	2,237	325	273,127	258,748	14,379		
1	Bridgewater	22,785	7,595	857	889,612	729,152	160,460		
6	Clark	14,739	4,913	320	338,599	303,148	35,451		
4	Chester	57	19	7	8,634	8,634			
7	Cranbury	12	4	50	48.736	41.683	7.053		
	Cranford	22,779	7,593	447	438,551	424.155	14.136		
	Dune11en	6.480	2.160	104	101.935	100.564	1.371		
10	Edison	3,735	1,245	171	164,521	110,792	53,729		
11	Elizabeth				239	239			
12	Fanwood	7.626	2.542	142	157.760	152.614	5.146		
13	Flemington Franklin				3,220	3,220			
14		675	225	28	53.570	51.719	1.851		
8	Garwood	4.623	1.541	86	68.878	66.771	2.107		
16	Greenbrook	3.726	1.242	136	150.171	_136.437_	13.734		
17	Hillsborough	18,291	6,097	737	634,816	484,527	150,289		
18	Hillside	18,060	6,020		285,211	275,780	9,431		
	Ken11worth .	9,141	3,047	166	175,922	163,942	11,980		
20	Lawrence	3,489	1,163	133	128,912	88,285	40,627		
11	Linden	34,239	11,413	22	719,392	619,014	100,378		
12	Middlesex	12.807	4,269	274	299.313	276.929	22,384		
23	Millstone	234	78	11	11.143	11.143			
4	Montgomery	3,855	1,285	286	269,904	220,206	49,698		
18	Mountainaide	7,599	2,533	206	244.046	227.765	16.281		
16	Passaic	***			348	348			
17	Peapack Gladstone North Plainfield	2.016 14,868	672	99 310	91.274 272,102	86.579 255,543	4.695		
18		The state of the s	4,956				16,559		
29	Piscataway	29,133	9,711	707	916,946	807,846	109,100		
10	Plainfield	31,464	10.488	657	576.114	564.3:3			
31	Plainsboro	6,801	2,267	289	288,093	147,943	140,150		
12	Princeton Borough	7,212	2,404	278	173.048	148.230	24.818		
13	Princeton Township	12,549	4,183	403	516,856	448,762	68,094		
14	Rabyay				12.062	7.188	4.874		
16	Raritan Borough	5,976	1.992	101	133.280	125.741	7.539		
16	Raritan Township	6,978	2,326	307	198,256	153.803	44,453		





### TERRITORY SERVED DURING YEAR

1. Column (b) should show the estimated permanent population at end of year for area served.

	NAME OF MUNICIPALITY OR OTHER POLITICAL SUBDIVISION  (6)	ESTIMATED PERMANENT POPULATION SERVED (b)	NO. OF CUSTOMERS END OF YEAR (c)	NO. QF FIRE HYDRANTS (d)	PECT OF MAINS		
					TOTAL (*)	ON PUBLIC WAYS (t)	ON PRIVATE RIGHT OF WAY (a)
	Readington	1,083	361	59	62,783	45,013	17,770
	Roselle	16.146	5.382	338	256,407	250.675	5,732
+-	Roselle Park ·	10,374	3,458	153	170.513	167,638	2.875
	Scotch Plains	20,850	6,950	414	548,370	503,141	45,229
	Somerville	10,419	3,473	180	238.122	194.817	43,305
	South Bound Brook	3,606	1,202	68	63,779	58,741	5,038
T		582	194	4			4.147
	South Brunswick South Plainfield	582 10,785	194 3,595	341	18.797 361,007	14.650 316,610	44,397
	Springfield			8	10,338	2,613	7,725
	Tewksbury	312	104	5	11,850	11,232	618
	Union	49.512	16,504	19	909.836	861.251	48.585
T	Warren	5,751	1,917	353	330,380	316.078	14,302
	Watchung		1,233	239	204.569	187.657	16.912
	Westfield	3,699 29,256	9,752	691	624,592	605,562	19,030
T	West Windsor	13,071	4,357	603	593,088	526,290	66,798
	Woodbridge			4	593.088 19,784	526,290 14,594	66,798 5,190
	Manville	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			12,948	8,776	4,172
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File No.

8003-454

Date:

June 9, 1995

Time: 9:15 AM [X] PM []

Incoming Call

From:

Chris Andreasen

(908) 634-1500 x-240

Telephone No.

Affiliation:

Middlesex Water Company

Malcolm Pirnie Staff: Andrew Clibanoff

(609) 860-0100

Telephone No.

### Summary of Conversation:

Mr. Andreasen returned my phone call from earlier in the week. Laszlo Keszler, our previous contact with the Middlesex Water Company is no longer with the company. I called the Middlesex Water Company to update our files concerning the water company's water distribution system.

There have been no major changes since we last contacted Middlesex Water Company in January 1994. Water from the same 32 wells is blended with surface water from one intake to serve approximately 52,000 service connections in South Plainfield, Metuchen, Carteret, Woodbridge, Edison and portions of Clark. The groundwater portion of the total system flow accounted for 31.4% in 1994. The surface water intake located in the Delaware-Raritan Canal accounted for 63.2% of the total system flow. The remaining percentage (5.4%) of water in Middlesex Water Company's distribution system was purchased from the Elizabethtown Water Company.

Wellfield Name	No. of wells	% of total system flow (1993)
Park Avenue	15	18.5
Spring Lake	4	2.9
Maple Avenue	2	1.8
Sprague Ave. Nos. 1 & 2	2	2.8
Tingley Lane North & South	9_	5.4
	32	31.4%

Water is also provided via bulk transmission lines to the Township of Edison, the Borough of Highland Park, Old Bridge Municipal Utilities Authority (MUA), the Borough of Sayreville, and the Marlboro Township MUA. Mr. Andreasen confirmed that because of the way the distribution system is set up, no significant amount of groundwater is able to reach the bulk transmission lines. However, the distribution system is set up in such a way that it is possible for water obtained from the wells and/or Elizabethtown Water Company to enter the bulk transmission lines.

File No.

8003-454

Date:

June 9, 1995

Time: 9:15 AM [X] PM []

Incoming Call

From:

Chris Andreasen

(908) 634-1500 x-240

Telephone No.

Page 2 of 2

Affiliation:

Middlesex Water Company

Malcolm Pirnie Staff: Andrew Clibanoff

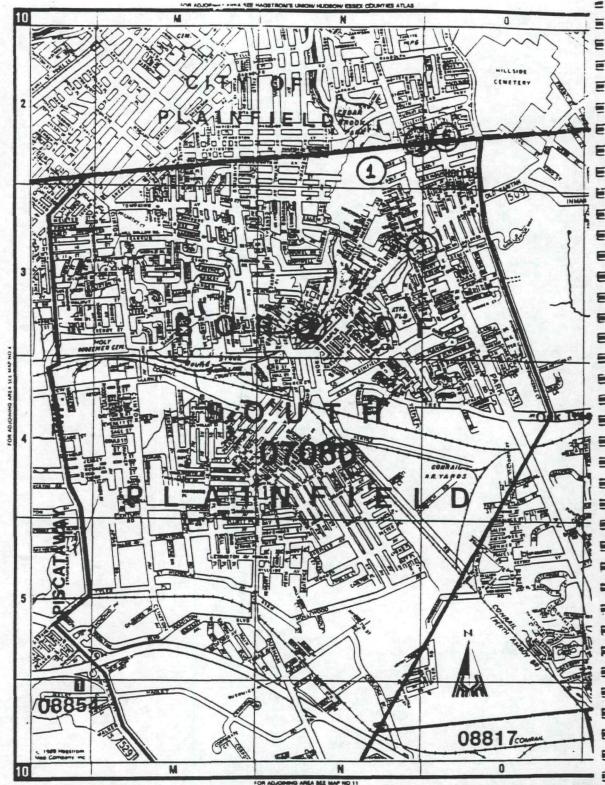
(609) 860-0100

Telephone No.

Summary of Conversation (cont'd)

I asked Mr. Andreasen if he knew the approximate percentage of water that is sent through the bulk transmission lines. Mr. Andreasen stated that the total daily system flow in the Middlesex Water Company distribution system is 45.2 million gallons/day (MGD). Of that total, 16.5 MGD is directed through the bulk transmission lines.

As far as the water purchased from Elizabethtown Water Company, three mains are connected into the Middlesex Water Company Distribution system.

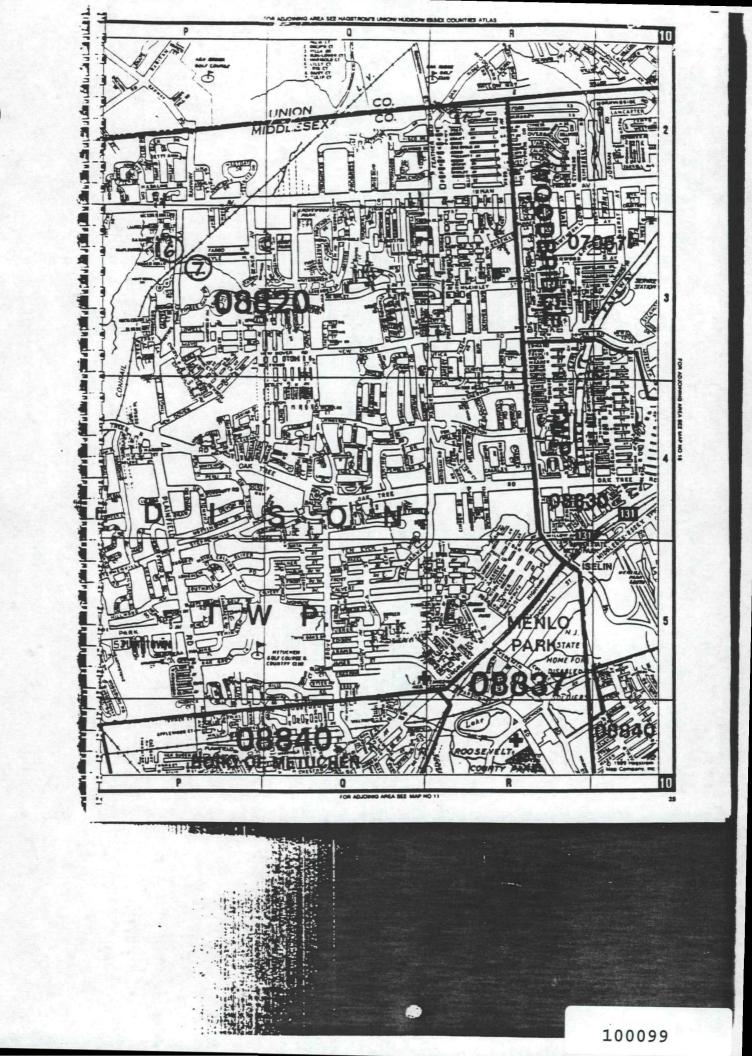


\* THE CENTER OF THE CIRCLES REPRESENTS.

THE APPROXIMATE DOCATION OF EACH WELL.

THE CORRESPONDING #'S CAN BE REFERE

ON THE ENCLOSED DISTRIBUTION SITE PLA.



PARK AVENUE.

15 WELLS.

DEPTH 73-0" min

501'-0" MAX

01

6 WELLS BETWEEN 73'-100'. 9 WELLS BETWEEN 448-501'

SPRAGUE AUENUE

2 WELLS

DEPTH 100-6"

SPRING LAKE.

4 WELLS.

DEPTH MAX 504'

MIN 500'

TINGKEY LANE NORTH

5 WELLS. DEPTH 700' MA

540' mi

TINGLEY LANE SOUTH

4 WELLS

DEPTH

MAX 528 MIN 500

100100

IDDLESEX ATER COMPANY

PROJECT WELLFIELD DEPTH TABLE.

DRAWN BY: J. U. CHECKED BY:

DATE: 3/23/92 SCALE:

### MIDDLESEX WATER SO. WELLFIELDS.

MARIE AVENUE

2 WELLS

DEDTH 351' £ 421'

BRULIS WICK SHALE ADVISED

PARK AVERUE.

15 WELLS.

DEPTH 73-0".

501'-0" ,

():1

STRATIFIED

6 WELLS BETWEEN 73 - 100'

BRANNICK SHAR 9 WELLS BETWEEN 448-501

AQUITERS

SPRAGUE AVENUE 2 WELLS

DEPTH 100-6

STRITIFIED DRIFT AQUITERS

SPRING LAKE.

4 WELLS.

DEPTH MAX 50

MIN 5

BRUNSWICK AQUIFER

TINGKEY LANE NORTH

5 WELLS. DEPTH 700'

540'

BRUNSWICK ADVITER

TINGLEY LANE SOUTH

4 WELLS DEPTH.

MAX

BRUUSWICK AQUIFER

mIN.

100101

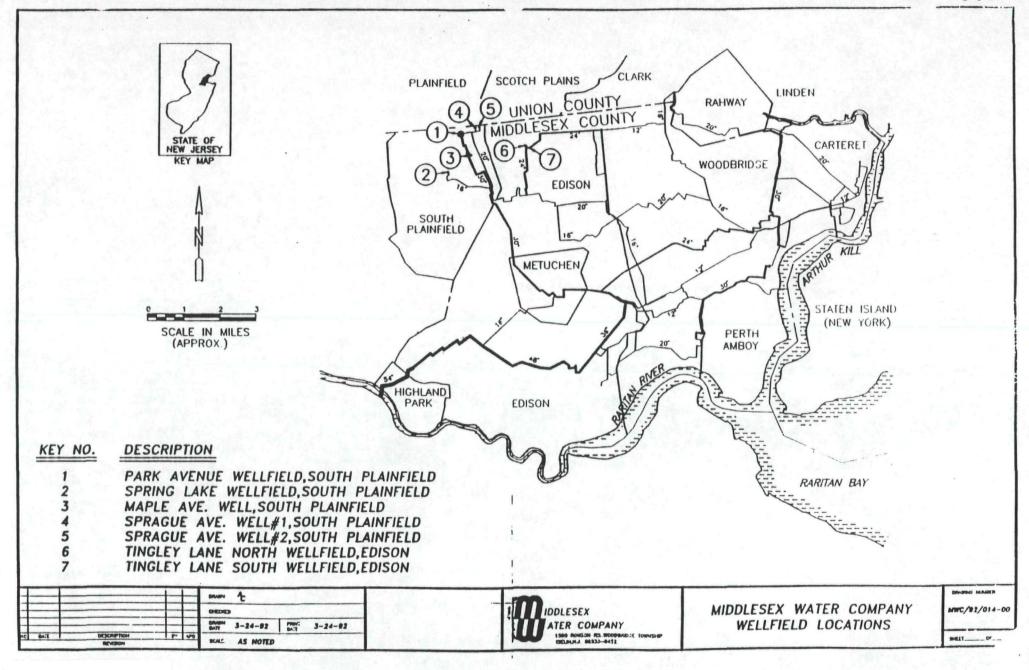
IDDLESEX ATER COMPANY 1500 RONSON RD. ISELIN. NEW JERSEY

PROJECT WELLFIELD DEPTH TABLE.

CHECKED BY: DATE: 3/23

SCALE:

DRAWN BY



File No.

8003293

Date:

February 17, 1994

Time: 4:15 AM [] PM [x]

Outgoing Call

To:

Jane Kutz

(908) 827-2100

Telephone No.

Affiliation:

City of Rahway Clerk's Office

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

I called to inquire about the city's potable water supply. Ms. Kutz informed me that Rahway has its own water plant which supplies most of the city water. Supplemental water is bought from the Elizabethtown Water Company.

File No.

8003293

Date:

February 24, 1994

Time: 11:00 AM [x] PM [

Outgoing Call

To:

George Hulnik

(908)388-0086

Telephone No.

Affiliation:

City of Rahway Division of Water

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

I called to inquire into the City's water supply system. Mr. Hulnik indicated that presently all the water is obtained through the intake on the Rahway River located off Valley Road and Lambert Street in Rahway. No other surface water intake is used. The Division does have some wells, but presently none are operational for a variety of reasons. All the wells are located within the general area of the Water Plant off Valley Road and Lambert Street. Mr. Hulnik requested I sent a letter detailing the information required.



### DIVISION OF WATER



SUPERINTENDENT'S OFFICE

GEORGE HULNIK
Superintendent of Water
PAUL A. KOZAKIEWICZ
Ass't. Water Superintendent

Water Treatment Plant 1045 Westfield Ave. Rahway, NJ 07065 Tel: (908) 388-0086 Fax: (908) 499-4781

March 7, 1994

Malcolm Pirnie Inc. 2 Corporate Park Drive Box 751 White Plains, NY 10602-0751

Attention: Laurie Droughton

Dear Ms. Droughton:

The City of Rahway, Division of Water has one operational well which at the present time is not being used. When used, this well, designated Well #6, is blended with our surface water supply. Enclosed find a map of the City of Rahway which shows well location and point at which the well is blended into our system.

Well #6 was drilled in 1966 and is 269 feet deep in a red shale formation, pumping level is 115 feet below the surface.

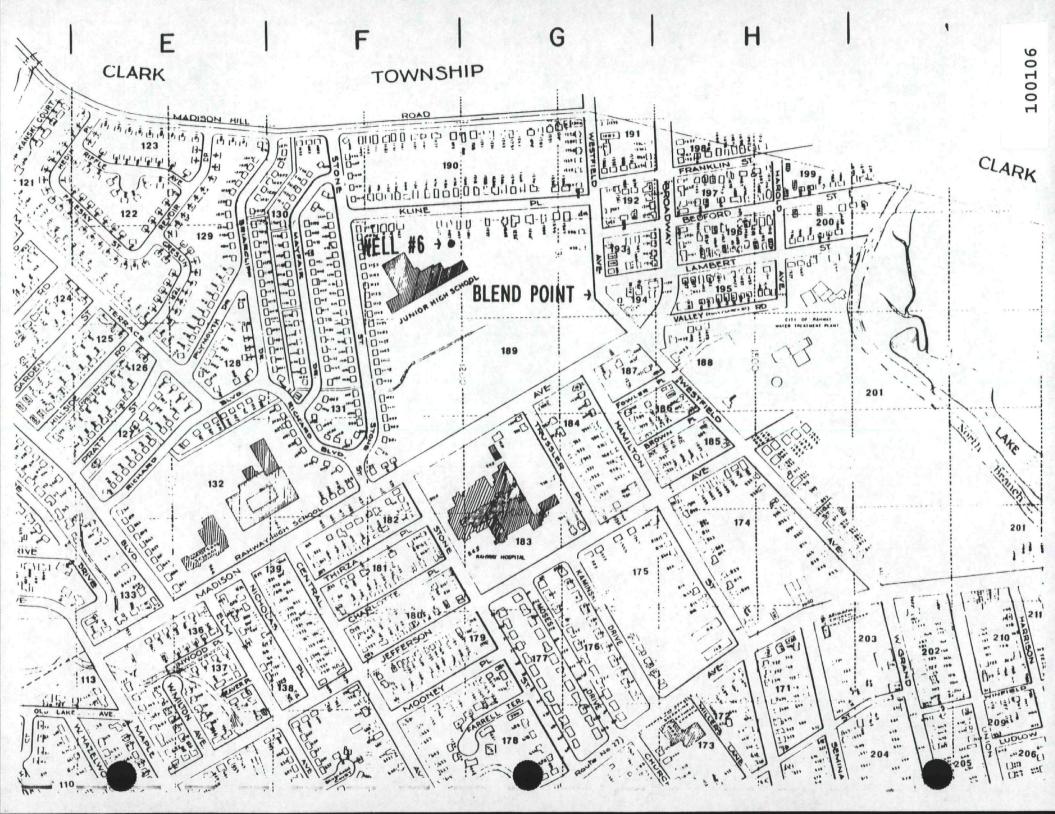
The Division of Water services the City of Rahway with about 8000 accounts and a population of 25,325. We also service an additional 79 accounts outside of Rahway near the City boundaries.

I hope the enclosed information plus the map answers your questions.

Very truly yours,

George Hulnik

Superintendent of Water



File No.

8003293

Date:

February 24, 1994

Time: 3:00 AM [] PM [x]

Outgoing Call

To:

Jim Lahrman

(718)643-5933

Telephone No.

Affiliation:

New York City Department of Health, Bureau of Public

Health Engineering

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

I called to inquire into the City's water supply system. The public water is supplied by the upstate New York reservoir system. Mr. Lahrman indicated that there used to be a series emergency standby wells on Staten Island, but these wells have been abandoned. He indicated there were no private drinking water wells.

File No.

8003293

Date:

February 17, 1994

Time: 4:00 AM [] PM [x]

Outgoing Call

To:

Vera Monaco

(908) 474-8445 Telephone No.

Affiliation:

City of Linden Clerk's Office

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

I called to inquire about the city's potable water supply. Ms. Monaco informed me that the Elizabethtown Water Company supplies all the city water. She referred me to the Board of Health for information regarding private wells.

File No.

8003293

Date:

February 24, 1994

Time: 10:00 AM [x] РМ П

Outgoing Call

To:

Nancy Koblis

(908)474-8409

Telephone No.

Affiliation:

City of Linden Board of Health

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

Ms. Koblis knows of only one private drinking water well located within the city. It is located at 136 Berwood Drive. She indicated it is possible there are other private wells, but does not know of any.

File No.

8003293

Date:

February 17, 1994

Time: 3:30 AM [] PM [x]

Outgoing Call

To:

Rosalie Rogan

(908) 643-4500

Telephone No.

Affiliation:

Woodbridge Township Clerk's Office

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

I called to inquire about the township's potable water supply. Ms. Rogan informed me that the Middlesex Water Company supplies all the township water. She referred me to the Department of Health for information regarding private wells.

File No.

8003293

Date:

February 17, 1994

Time: 4:34 AM [] PM [x]

Outgoing Call

To:

Phil Bujalski

(908)855-0600

Telephone No. Affiliation: Woodbridge Township Department of Health, Chief Inspector

Malcolm Pirnie Staff: Laurie Droughton

(914) 641-2970

Telephone No.

Summary of Conversation:

Mr. Bujalski does not know of any private water wells within the township.

**REFERENCE NO. 5** 

To:File Date: May 10, 1995			
From: David Kahlenberg	roject #: 8003-431		
Subject:Surface Water Pathway	Site Name: LCP Chemicals		

The following table characterizes the surface water pathway for the LCP Chemicals site. The in-stream distances were measured with an opisometer on the Arthur Kill, NY-NJ; Elizabeth, NY-NJ; Roselle, NJ; Keyport, NJ; and Perth Amboy, NJ; U.S. Geological Survey (USGS) quadrangles and US Department of Interior National Wetlands Inventory (NWI) Maps (Ref. Nos. 2; 3). Wetland frontage was measured with an opisometer on the National Wetlands Inventory maps for the abovementioned quadrangles (Ref. No. 3).

Water Body	In-Stream Distance (Miles)	Avg. Annual Flow Rate (CFS)	Wetland Frontage (Miles)
South Branch Creek	0.31	>10	0.62
Arthur Kill	9.99	NA*	2.77
Raritan Bay	4.7	NA*	7.9
Total:	15.0		11.29

No surface water intakes are located on any of the water bodies located within the fifteen-mile surface water pathway target distance limit. The South Branch Creek is classified by the State of New Jersey for the maintenance, migration, and/or propagation of natural and established biota.

The Arthur Kill supports both freshwater and saltwater fish. The following fish are caught for recreational purposes: American eels, crabs, striped bass, white perch, and blue fish. Fish species caught on the Raritan Bay for recreational purposes include weakfish, blue fish, winter flounder, summer flounder, striped bass, sea bass, tautog, scrup, spot, and croaker. Fish species caught on the Raritan Bay for commercial purposes include shad, eel, lobster, blue crab, and oyster. The New Jersey Department of Environmental Protection has a health advisory for the fish caught in both the Arthur Kill and Raritan Bay. For the Arthur Kill, the sale or consumption of striped bass and blue crabs, and the sale of American eels are prohibited. While there is a limited consumption advisory for blue fish, white catfish, and white perch. For the Raritan Bay, limited consumption is advised for blue fish, striped bass, white catfish, and white perch.

\* - Coastal Tidal Water

#### **EXPLANATION**

POTENTIAL YIELD OF WATER TO WELLS IN UNCONSOLIDATED AQUIFERS

	UNCONFINED AQUIFERS, 10 to 100 GALLONS PER MINUTESand and gravel with
	saturated zone generally less than 10 ft thick, or thicker but
The of the se	with less permeable silty sand and gravel. Yields in areas
	adjacent to streams may exceed 100 gal/min through pumping-induced
	infiltration, but these areas are too small to show at this scale.

UNCONFINED AQUIFERS, MORE THAN 100 GALLONS PER MINUTE--Sand and gravel of high transmissivity and with saturated thickness greater than 10 ft. Many such areas are associated with surface-water sources that can provide additional water through pumping-induced recharge.

AQUIFER OF UNKNOWN POTENTIAL--Areas of sand or sand and gravel for which little or no well data are on file to determine yield potential. Letter symbols, explained below, indicate the type of deposit.

Lacustrine or eolian--Fine to medium sand that probably yields less than 10 gal/min.

Kame, kame terrace, kame moraine, outwash, or alluvium——Sand and gravel of unknown thickness or saturation. Yield potential is greater where streams are present.

PRIMARY WATER-SUPPLY AQUIFER--A highly productive aquifer that is being used as a source of water supply by major public-supply systems. Number indicates name of aquifer area (see key below) and report number in list of related publications. Reports and maps cited describe these aquifers in detail.

Primary aquifer	
number	Aquifer area
1	South Fallsburg-Woodbourne area
3	Ramapo and Mahwah Rivers area
4	Fishkill and Sprout Creeks area
5	Croton-Ossining area

### **Surface Water Quality Standards**

N.J.A.C. 7:9B



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY

Office of Land and Water Planning April 1994



- (f) A reclassification for more restrictive uses may be made when:
  - It is demonstrated to the satisfaction of the Department that the waters should be set aside to represent the natural aquatic environment and its associated biota; or
  - It is demonstrated to the satisfaction of the Department that a more restrictive use is necessary to protect a unique ecological system or threatened/endangered species.
- (g) In those cases in which a thermal discharge is involved, the procedures for reclassifying segments for more restrictive uses shall be consistent with section 316 of the Federal Clean Water Act.

### 7:9B-1.12 Designated uses of FW1, PL, FW2, SE1, SE2, SE3, and SC waters

- (a) In all FW1 waters the designated uses are:
  - Set aside for posterity to represent the natural aquatic environment and its associated biota;
  - 2. Primary and secondary contact recreation;
  - Maintenance, migration and propagation of the natural and established aquatic biota; and
  - 4. Any other reasonable uses.
- (b) In all PL waters the designated uses are:
  - 1. Cranberry bog water supply and other agricultural uses;
  - Maintenance, migration and propagation of the natural and established biota indigenous to this unique ecological system;
  - Public potable water supply after such treatment as required by law or regulations;
  - Primary and secondary contact recreation; and
  - 5. Any other reasonable uses.
- (c) In all FW2 waters the designated uses are:

- Maintenance, migration and propagation of the natural and established biota;
- 2. Primary and secondary contact recreation;
- 3. Industrial and agricultural water supply;
- Public potable water supply after such treatment as required by law or regulation; and
- 5. Any other reasonable uses.
- (d) In all SE1 waters the designated uses are:
  - 1. Shellfish harvesting in accordance with N.J.A.C. 7:12;
  - Maintenance, migration and propagation of the natural and established biota;
  - 3. Primary and secondary contact recreation; and
  - 4. Any other reasonable uses.
- (e) In all SE2 waters the designated uses are:
  - Maintenance, migration and propagation of the natural and established biota;
  - 2. Migration of diadromous fish;
  - 3. Maintenance of wildlife;
  - 4. Secondary contact recreation; and
  - 5. Any other reasonable uses.
- (f) In all SE3 waters the designated uses are:
  - 1. Secondary contact recreation;
  - 2. Maintenance and migration of fish populations;
  - Migration of diadromous fish;
  - 4. Maintenance of wildlife; and

- 5. Any other reasonable uses.
- (g) In all SC waters the designated uses are:
  - 1. Shellfish harvesting in accordance with N.J.A.C. 7:12;
  - 2. Primary and secondary contact recreation;
  - Maintenance, migration and propagation of the natural and established biota; and
  - 4. Any other reasonable uses.
- 7:9B-1.13 Designated uses of mainstem Delaware River and Delaware Bay as set forth in the "Delaware River Basin Commission, dministrative Manual Part III Water Quality Regulations," rticle 3, dated May 22, 1991 including all amendments and future supplements thereto.
- (a) The designated uses for the mainstem Delaware River and Delaware Bay are those contained in "Delaware River Basin Commission, Water Quality Regulations, Administrative Manual - Part III," Article 3, dated May 22, 1991, including all amendments and future supplements thereto.
- (b) The designated uses for other waters under the jurisdiction of the DRBC are as set forth at N.J.A.C. 7:9B-1.15(d).

### 7:9B-1.14 Surface water quality criteria

- (a) Surface water quality criteria for FW1 waters shall be maintained as to quality in their natural state.
- (b) Surface water quality criteria for PL waters are as follows:
  - These waters shall be maintained as to quality in their existing state or that quality necessary to attain or protect the designated uses, whichever is more stringent.
    - For Nitrate-Nitrogen a level of 2 mg/l shall be maintained in the surface waters unless it is shown that a lower level must be maintained to protect the existing surface water quality.
    - ii. A pH level between 3.5 and 5.5 shall be maintained unless it is demonstrated that a pH level outside of that range is necessary to protect the existing/ designated uses.

### 7:9B-1.15 Surface water classifications for the waters of the State of New Jersey

- (a) This section contains the surface water classifications for the waters of the State of New Jersey. Surface water classifications are presented in tabular form.
   Subsections (c) through (g) contain surface water classifications by major drainage basin. Subsection (h) lists FW1 waters by tract within basins and subsection (i) identifies the Outstanding National Resource Waters of the State.
- (b) The following are instructions for the use of Tables 1 through 5 found in N.J.A.C. 7:9B-1.15(c) through (g) respectively:
  - The surface water classification tables give the surface water classifications for waters of the State. Surface waters of the State and their classification are listed in the table covering the major drainage basin in which they are located. The major drainage basins are:
    - The Atlantic Coastal drainage basin which contains the surface waters listed in Table 1 in (c) below;
    - ii. The Delaware River drainage basin which contains the surface waters listed in Table 2 in (d) below;
    - iii. The Passaic River, Hudson River and New York Harbor Complex drainage basin which contains the surface waters listed in Table 3 in (e) below;
    - iv. The Raritan River and Raritan Bay drainage basin which contains the surface waters listed in Table 4 in (f) below; and
    - v. The Wallkill River drainage basin which contains the surface waters listed in Table 5 in (g) below.
  - 2. Within each basin the waters are listed alphabetically and segment descriptions begin at the headwaters and proceed downstream.
  - 3. To find a stream:
    - i. Determine which major drainage basin the stream is in;
    - Look for the name of the stream in the appropriate Table and find the classification;
    - iii. For unnamed or unlisted streams, find the stream or other waterbody that the stream of interest flows into and look for the classification of that stream or waterbody. The classification of the stream of interest may then be determined by referring to (b)5 below. If the second stream or waterbody is also unlisted, repeat the process until a listed stream or waterbody is found. Use (b)5iv below to classify streams entering unlisted lakes.
  - 4. To find a lake or other non-stream waterbody:
    - i. Determine which major drainage basin the waterbody is in;
    - ii. Look for the waterbody name in the appropriate Table;
    - iii. If the waterbody is not listed, use (b)5ii, 5iii, 5vi, and 5vii below to determine the appropriate classification.

- 5. To find unnamed waterways or waterbodies or named waterways or waterbodies which do not appear in the listing, use the following instructions:
  - i. Unnamed or unlisted freshwater streams that flow into streams classified as FW2-TP, FW2-TM, or FW2-NT take the classification of the classified stream they enter, unless the unlisted stream is a PL water which is covered in (b)5vii below. If the stream could be a C1 water, see (b)5vi below.
  - ii. All freshwater lakes, ponds and reservoirs that are five or more acres in surface area, that are not located entirely within the Pinelands Area boundaries (see (b)5vii below) and that are not specifically listed as FW2-TP or FW2-TM are classified as FW2-NT. This includes lakes, ponds and reservoirs on segments of streams which are classified as FW2-TM or FW2-TP such as Saxton Lake on the Musconetcong River. If the waterbody could be a C1 water, also check (b)5vi below.
  - iii. All freshwater lakes, ponds and reservoirs, that are less than five acres in surface area, upstream of and contiguous with FW2-TP or FW2-TM streams, and which are not located entirely within the Pinelands Area boundaries (see(b)5vii below) are classified as FW2-TM. All other freshwater lakes, ponds and reservoirs that are not otherwise classified in this subsection or the following Tables are classified as FW2-NT. If the waterbody could be a C1 water, also check (b)5vi below.
  - iv. Unnamed or unlisted streams that enter FW2 lakes, ponds and reservoirs take the classification of either the listed tributary stream flowing into the lake with the highest classification or the listed tributary stream leaving the lake with the highest classification, whichever has the highest classification, or, if there are no listed tributary or outlet streams to the lake, the first listed stream downstream of the lake. If the stream is located within the boundaries of the Pinelands Area, see (b)5.vii. below; if it could be a C1 water, also see (b)5vi below.
  - v. Unnamed or unlisted saline waterways and waterbodies are classified as SE1 in the Atlantic Coastal Basin. Unnamed or unlisted saline waterways which enter SE2 or SE3 waters in the Passaic, Hackensack and New York Harbor Complex basin are classified as SE2 unless otherwise classified within Table 3 in (e) below. Freshwater portions of unnamed or unlisted streams entering SE1, SE2, or SE3 waters are classified as FW2-NT. This only applies to waters that are not PL waters (see (b)5vii below). If the waterbody or waterway could be a C1 water, also see (b)5vi below.
  - vi. If the waterway or waterbody of interest flows through or is entirely located within State parks, forests or fish and game lands, Federal wildlife refuges, other special holdings, or is a State shellfish water as defined in this subchapter, the Department's maps should be checked to determine if the waterbody of interest is mapped as a C1 water. If the waterway or waterbody does not appear on the United States Geological Survey quadrangle that the Department used as a base map in its designation of the

- C1 waters, the Department will determine on a case-by-case basis whether the waterway or waterbody should be designated as C1.
- vii. All waterways or waterbodies, or portions of waterways or waterbodies, that are located within the boundaries of the Pinelands Area established at N.J.S.A. 13:18A-11a are classified as PL unless they are listed as FW1 waters in Table 6 in (h) below. A tributary entering a PL stream is classified as PL only for those portions of the tributary that are within the Pinelands Area. Lakes are classified as PL only if they are located entirely within the Pinelands Area.
- The following 10 classifications are used for the sole purpose of identifying the water quality classification of the waters listed in the Tables in (c) through (h) below:
  - "FW1" means freshwaters wholly within Federal or State lands or special holdings that are preserved for posterity and are not subject to manmade wastewater discharges.
  - ii. "FW2-TP" means FW2 Trout Production.
  - iii. "FW2-TM" means FW2 Trout Maintenance.
  - iv. "FW2-NT" means FW2 Non Trout.
  - v. "PL" means Pinelands Waters.
  - vi. "SE1" means saline estuarine waters whose designated uses are listed in N.J.A.C. 7:9B-1.12(d).
  - vii."SE2" means saline estuarine waters whose designated uses are listed in N.J.A.C. 7:9B-1.12(e).
  - viii."SE3" means saline estuarine waters whose designated uses are listed in N.J.A.C. 7:9B-1.12(f).
  - ix. "SC" means the general surface water classification applied to saline coastal waters.
  - x. FW2-NT/SE1 (or a similar designation that combines two classifications) means a waterway in which there may be a salt water/fresh water interface. The exact point of demarcation between the fresh and saline waters must be determined by salinity measurements and is that point where the salinity reaches 3.5 parts per thousand at mean high tide. The stream is classified as FW2-NT in the fresh portions (salinity less than or equal to 3.5 parts per thousand at mean high tide) and SE1 in the saline portions.
- 7. The following water quality designations are used in Tables 1 through 5 in (c) through (g), respectively, below:
  - i. "(C1)" means Category 1 waters;
  - ii. "(tp)" indicates trout production in waters which are classified as FW1. This is for information only and does not affect the water quality criteria for those waters:
  - iii. "(tm)" indicates trout maintenance in waters which are classified as PL or FW1. For FW1 waters this is for information only and does not affect the water quality criteria for those waters.

(e) The surface water classifications in Table 3 are for waters of the Passaic, Hackensack and New York Harbor Complex Basin:

### TABLE 3

Waterbody	Classification
APSHAWA BROOK (Macopin) - Entire length ARTHUR KILL	FW2-TP(C1)
(Perth Amboy) - The Kill and its saline New Jersey tributaries between the Outerbridge Crossing and a line connecting Ferry Pt., Perth Amboy to Wards Pt., Staten Island, New York	SE2
(Elizabeth) - From an east-west line connecting Elizabethport with Bergen Pt., Bayonne to the Outerbridge Crossing	SE3
(Woodbridge) - All freshwater tributaries	FW2-NT
BEAR SWAMP BROOK (Mahwah) - Entire length	FW2-TP(C1)
BEAR SWAMP LAKE (Ringwood State Park)	FW2-NT(C1)
BEAVER BROOK	
(Meriden) - From Splitrock Reservoir Dam downstream to Meriden Road Bridge	FW2-TP(C1)
(Denville) - Meriden Road Bridge to Rockaway River TRIBUTARIES	FW2-NT
(Meriden) - Two tributaries located approximately three quarters of a mile southwest of Meriden BEECH BROOK	FW2-TP(C1)
(West Milford) - From State line downstream to Monksville Reservoir	FW2-TM
BELCHER CREEK (W. Milford) - Entire length	FW2-NT
BERRYS CREEK (Secaucus) - Entire length BLACK BROOK	FW2-NT/SE2
(Meyersville) - Entire length, except segment described below	FW2-NT
(Great Swamp) - Segment and tributaries within the Great Swamp National Wildlife Refuge	FW2-NT(C1)
BLUE MINE BROOK	
(Wanaque) - Entire length, except segment described below	FW2-TM
(Norvin Green State Forest) - That portion of the stream and any tributaries within the Norvin Green State Forest	FW2-TM(C1)
BRUSHWOOD POND (Ringwood State Park)	FW2-TM(C1)
(	

Channel Marker Flashing Red 2 and terminating
on the eastern shoreline of the Galilee section of
Monmouth Beach.

Monmouth Beach.	
NESHANIC RIVER (Reaville) - Entire length	FW2-NT
NORTON BROOK (Norton) - Entire length	FW2-TP(C1)
OAKDALE CREEK (Chester) - Entire length	FW2-TP(C1)
OAKEYS BROOK (Deans) - Entire length	FW2-NT
OCEANPORT CREEK	
(Fort Monmouth) - Source to a line beginning on the	FW2-NT/SE1
easternmost extent of Horseneck Point and	
bearing approximately 140 degrees T (True	
North) to its terminus on the westernmost extent	
of an unnamed extent of Monmouth Boulevard in	
Oceanport	
(Oceanport) - Creek downstream of line described above PARKERS CREEK	SE1(C1)
(Fort Monmouth) - Source to a line beginning on the	FW2-NT/SE1
easternmost extent of Horseneck Point and	
bearing approximately 000 degrees T (True	
North) to its terminus on Breezy Point on the	
Little Silver side (north) side of the creek	
(Fort Monmouth) - Creek downstream of line	SE1(C1)
described above	The state of the state of
PEAPACK BROOK (Gladstone) - Entire length	FW2-TP(C1)
PETERS BROOK (Somerville) - Entire length	FW2-NT
PIGEON SWAMP (Pigeon Swamp State Park) - All waters	FW2-NT(C1)
within the boundaries of Pigeon Swamp State	
Park	
PIKE RUN (Belle Meade) - Entire length	FW2-NT
PINE BROOK (Clarks Mills) - Entire length	FW2-NT
PINE BROOK (Cooks Mill) - Entire length	FW2-TM
PLEASANT RUN (Readington) - Entire length	FW2-NT
PRESCOTT BROOK (Stanton Station) - Entire length	FW2-TM
RAMANESSIN (HOP) BROOK (Holmdel) - Entire length	FW2-TM
RARITAN BAY - Entire drainage	FW2-NT/SE1
RARITAN RIVER	
NORTH BRANCH (Also see INDIA BROOK)	
(Pleasant Valley) - Source to, but not including,	FW2-TP(C1)
Ravine Lake	
(Far Hills) - Ravine Lake dam to Rt. 512 bridge	FW2-TM
(Bedminister) - Rt. 512 bridge to confluence with	FW2-NT
South Branch, Raritan River	
SOUTH BRANCH RARITAN RIVER	
(Mt. Olive) - Source to the dam that is 390 feet	FW2-NT(C1)

upstream of the Flanders-Drakestown Road bridge and the two tributaries which originate north and east of the Budd Lake Airfield	
(Mt. Olive) - Dam to confluence with Turkey Brook	FW2-TM(C1)
(Naughright) - Confluence with Turkey Brook to confluence with Electric Brook	FW2-TP(C1)
(Clinton) - Confluence with Electric Brook to downstream end of Packers Island, except segment described separately, below	FW2-TM
(Ken Lockwood Gorge) - River and tributaries within Ken Lockwood Gorge Wildlife Management Area	FW2-TM(C1)
(Neshanic Sta.) - Downstream end of Packers Island to confluence with North Branch, Raritan River	FW2-NT
MAIN STEM RARITAN RIVER	
(Bound Brook) - From confluence of North and South Branches to Landing Lane bridge in New Brunswick and all freshwater tributaries	FW2-NT
downstream of Landing Lane bridge.	054
(Sayreville) - Landing Lane bridge to Raritan Bay and all saline water tributaries	SE1
RINEHART BROOK (Hacklebarney) - Entire length	FW2-TP(C1)
ROCK BROOK (Montgomery) - Entire length ROCKAWAY CREEK NORTH BRANCH	FW2-NT
(Mountainville) - Source to Rt. 523 bridge	FW2-TP(C1)
(Whitehouse) - Rt. 523 bridge to confluence with South Branch	FW2-TM
SOUTH BRANCH (Whitehouse) - Entire length	FW2-TM
MAIN STEM (Whitehouse) - Confluence of North and South Branches to Lamington River	FW2-NT
ROCKY RUN - (Lebanon) - Entire length	FW2-TP(C1)
ROUND VALLEY RESERVOIR (Clinton)	FW2-TP
ROYCE BROOK (Manville) - Entire length SHREWSBURY RIVER	FW2-NT
(Little Silver) - Source to Rt. 36 highway bridge	SE1(C1)
(Highlands) - Rt. 36 bridge to Sandy Hook Bay	SE1
SIMONSON BROOK (Griggstown) - Entire length SIX MILE RUN	FW2-NT
(Franklin Church) - Entire length, except segment described below	FW2-NT
(Hillsborough) - Segment within the boundaries of Six Mile Run State Park	FW2-NT(C1)

# SURFACE WATER INTAKE LOCATIONS BUREAU OF SAFE DRINKING WATER

Prepared by: Michael Mariano

### STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION EUREAU OF SAFE DRINKING WATER MARCE 1992

PAZID\$	PURVETOR NAME	PHONE NUMBER	INTAKE HUNICIPALITY	INTAKE LOCATION
0102001	ATLANTIC CITY WATER DEPARTMENT	609-345-3315	ABSECON	DOUGETY POND - South tip - Mays Landing Rd. & Mill Rd.
0238001	HACKENSACK WATER DEPARTMENT	201-767-9300	PARAMUS	SADDLE RIVER - South of intersection of Parasus Ed. & Midland Ave.
	1		ORADELL	HACIENSACI RIVER - At Martin Ave.
			NORTHVALE	SPARE HILL CREEK - Northwest of intersection of Pegasus Ave. & Hill Terr.
			ORADELL	LONG SWAMP BROOK - At Martin Ave.
0305001	BURLINGTON CITY WATER DEPARTMENT	609-386-0307	EAST BURLINGTON	DELAWARE RIVER - 1/4 mile north of Assiscunk Creek
			BURLINGTON ISLAND	BURLINGTON ISLAND LAKE
0325001	FORT DIX	609-542-5040		PARCOCAS CREEK
1613001	NJDA2C	201-575-0225	POMPTON LAKES	PANAPO RIVER - At Pompton Lake (pump to Wanaque Res.)
				Ave & Oricchio Ave
0717001	CITY OF ORANGE	201-762-6000	SOUTH ORANGE	ORANGE RESERVOIR - On West branch of Rahway River 40 ft upstream from dam

#### STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION SURRAU OF SAFE DRINKING WATER WARCE 1992

PWSID#	PURVETOR NAME	PHONE NUMBER	INTALE MUNICIPALITY	INTAKE LOCATION
071 <b>200</b> 1	NJ AMERICAN NORTHERN DISTRICT	201-376-8800	KILLBURN	PASSAIC RIVER - At fenneny Parkway
			SHORT HILLS	CANOR BROOK - North of Route 24
			CTTDAELT	POMPTON RIVER - At Bridges Rd.
0714001	NEWARL WATER DEPT	201-256-4965		PEQUANNOCE WATER SEED
0906001	JERSET CITY VATER DEPARTMENT	201-547-4390	BOORTON	BOONTON RESERVOIR - 200 yds northwest of Washington St Bridge
			ROCKAYAY	SPLIT ROCK RESERVOIR - Empties into Boomton Res. via Rockaway River
1017001	LAMBERTYILLE WATER DEPARTMENT	609-397-0526	LANBERTVILLE	STAN CREEK RESERVOIR PAST
	1	1	LANBERTVILLE	DELAVARE-PARITAN CANAL - At Swam St. (Emergency)
1111001	CITY OF TRENTON	609-989-3208	TREATON	DELAWARE RIVER - At Rt 29 horth of Calhoun St. Bridg
1216001	PERTE AMBOY	908-826-0290	OLD BRIDGE	TERMENTS POND - At Vaterworks Rd.
1225001	MIDDLESEX VATER CO	908-634-1500	? RDISON	DELAVARE-RARITAN CANAL & MILLSTONE RIVER - At Rt 18
	i	1	1	

### STATE OF NEW JESSET DEPARTMENT OF ENVIRONMENTAL PROTECTION SUREAU OF SAFE DRINKING WATER WARCE 1992

PA2ID\$	PURVETOR NAME	PHONE NUMBER	INTAKE MUNICIPALITY	INTAKE LOCATION
1214001	NEW BROWSWICK	908-745-5060	NEW BRUNSWICK	LAWRENCE BROOK - At Burnes S
			NEW BRUNSWICE	DELAWARE-RARITAN CANAL - At George St & College Ave
1214001	NORTH BRUNSWICK	908-247-0922	PRANKLIN TWP	DELAWARE-RABITAN CANAL - At Suydan Ave.
1219001	SATERVILLE	908-390-7000	OLD BRIDGE	SOUTH RIVER - At Main St North of Rt 18
1352005	NEW JERSEY WATER SUPPLY AUTH.		WALL TWP	MANASQUAN RIVER - Eospital Rd. North of Garden State Parkway (Pump to Manasquan Reservor)
1345001	NJ AMERICAN -		AVET JAB	MANASQUAN RIVER - Hospital Ed. North of GSP (Pump to Glendola Reservoir)
			NEPTURE TYP	SHARK RIVER - Off Corlies Ave. 2000' Worth of GSP
			NEPTUNE TYP	JUMPING BROOK - At Greensgrove & Corlies Aves
			LINCROFT	SWIMMING RIVER RESERVOIR -
1326004	HATCEAPONIX		MANALAPAR	MATCHAPONIX BROOK - At Wilson Ave.
1401001	TOWN OF BOONTON	201-299-7740	ROBLAITTE	TAYLORTOWN RESERVOIR -

# STATE OF NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION SUREAU OF SAFE DRINKING WATER WARCE 1992

PWSID#	PURVETOR NAME	PHONE NUMBER	INTARE MUNICIPALITY	INTAKE LOCATION
1403001	BUTLER WATER DEPT		BUTLEE	LIEBOUT RESERVOIR - At Reservor Rd.
1424001	SOUTH BAST MORRIS COUNTY	201-538-5600	AEMDEVA	CLYDE POTTS RESERVOIR - Cold Hill Ed & Woodland Ed
1506001	BRICK TYP	908-458-7000		NETEDECONE RIVER
1603001	SALEDON WATER DEPT	•••••••	EALEDON	HALEDOE RESERVOIR - Lower Basin pump station at Belmont Ave.
1605002 PASSAIC VALLEY WATER COMMISSION	201-256-1566	VATNE	POMPTON RIVER - At Confluence of Ramapo & Pequannock Rivers	
			TOTOVA	PASSAIC RIVER - At Union Blvd.
1708300	PRESTILLE	609-299-5000		SALEK CARAL
1712001	SALEK WATER DEPT	609-935-0350	CLINTON TYP	LAUREL LAKE - At Vaterworks Rd & Lake Ave.
	1	ALTONAT TAB	BLEINTON MILL POND - Waterworks Rd. 3 miles east of Laurel Lake (Seasonal)	
1903001	BRANCEVILLE WATER DEPARTMENT	201-948-6463	FRANKPORD TWP	BRANCEVILLE RESERVOIR - 7300' nornteast of Mattiso Ave & Mattison School Rd.
1906002	FRANKLIN VATER DEPT	201-827-7060	PRANCLIN BOROUGE	PRANELIN POND - Franklin Ave. Across from plant
1915001	NEWTON VATER DEPT	201-383-3521	SPARTA TYP	HORRIS LAKE

### STATE OF HEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION BURRAU OF SAPE DRINKING WATER KARCE 1992

PAZIDS	PURVETOR NAME	PHONE NUMBER	INTATE : SUMICIPALITY	INTAKE
1921001	SUSSEX WATER DEPT	201-967-5622	YANTAGE TYP	COLESVILLE RESERVOIR - At. Brink Ed. 400' west of the Rt. 23
2013001	RABWAY WATER DEPT	201-388-0086	LAIVAT	RARWAY RIVER - At pump station off Valley Ed & Lambert St.
2004002	ELIZABETETOWN -	201-245-444	VBRIDGEWATER TYP	PARITAN & MILLSTONE RIVERS
2108001	HACKETTSTOWN HUA	201-852-3622	DRAKESTOWN	MINE HILL RESERVOIR - Off Mine Bill Rd.
			DRAKESTOWN	BURD RESERVOIR - Off Reservoir Rd. Southeast of

File No.

8003-293

Date:

April 14, 1994

Time: 10:00 AM [x] PM []

Outgoing Call

To:

Mark Boriek

(609)-771-3967 Telephone No.

.

Affiliation:

NJDEPE Freshwater Fisheries

Malcolm Pirnie Staff: Mark Muller

(914) 641-2984

Telephone No.

#### Summary of Conversation:

Mr. Boriek stated that the Arthur Kill supports both freshwater and saltwater fish. He listed american eels, crabs, stripe bass, white perch, and blue fish as the most commonly caught fish. The NJDEPE has an advisory for fish caught in the Arthur Kill. He will fax me the terms of the advisory. Mr. Boriek said he knows that people do eat fish from the Arthur Kill because the NJDEPE is trying to address the problem of people ignoring the advisory.

# OW TO REDUCE ONSUMER KPOSURE TO FISH ONTAMINATED WITH OXIC CHEMICALS 'CB'S, DIOXINS, HLORDANE, ETC.)

### **FATEWIDE ADVISORY and/or ROHIBITION:**

Striped Bass—all sales prohibited. American Eels—advised limited conimption (especially the Northeast reon).

Bluefish—advised limited consumpm of large bluefish (over six pounds - 24 inches).

#### . NEWARK BAY COMPLEX

Prohibited—Sale or consumption of I fish, shelifish, or crustaceans from the Tidal Passale River; sale or contemption of striped bass and blue rabs and sale of American ecis from the entire complex. Advised—limited consumption of bluefish, white catilish and white perch.

Newark Bay Complex includes lewark Bay, Passate River (up to rundee Dam), Hackensack River (up to tradell Dam), Arthur Kill and Kill van (uil and tidal portions of all tributares.\*

#### 1. HUDSON RIVER (NJ waters)

Advised—very limited consumption of striped base and limited consumption of white perch, white catfish and bluefish. Prohibited—sale of American sels.

Hudson River includes the River up to the NJ-NY border, approximately four miles above Alpine, N.J., and Upper New York Bay.\*

#### C. LOWER NEW YORK BAY

Lower New York Bay is not in New Jersey State waters. While New Jersey's guidelines may be helpful, fishermen in NY waters, including Lower New York Bay and the NY part of the Upper New York Bay and Hudson River should also consult New York State's advisories, which are similar to New Jersey's. \*For information on NY's advisories contact NY DEC, Bldg, 40, SUNY, Stony Brook, NY 11794; 516-751-7900.

#### D. RARITAN BAY COMPLEX

Advised—limited consumption of blueflah, striped base, white catflah and white perch.

Raritan Bay Complex includes the NJ portion of Sandy Hook and Raritan Bays and the tidal portion of the Raritan River upstream to the Rt. 1 bridge and New Brunswick. and the tidal portions of all tributaries."

#### E. NORTHERN COASTAL WATERS

Advised—limited consumption of striped bass.

Northern Coastal Waters includes all coastal waters from Raritan Bay south to Barnegat Inlet.

#### F. CAMDEN AREA

Prohibited—sale and consumption of all fish, crustaceans and shelifish.

Camden Area includes Strawbridge Lake, Pennsauken Creek (N and S branches), Cooper River and its drainage, Cooper River Lake, Stewart Lake, and Newton Lake.\*

#### G. SOUTHERN DELAWARE RIVER

Advised—against consumption of channel catilsh. Prohibited—sale of channel catilsh.

Southern Delaware River refers to that area of the River between interstate 278 Bridge, Burlington Township, Burlington County, and Birch Creek, Logan Township, Gloucester County, approximately at the PA-DE border across the River (approx. 2 miles below the Commodore Barry Bridge).\*

\*Detailed delineations of areas are for purposes of these guidelines only (under NJAC 7:25-18A, etc.).

#### DEFINITIONS

Limited Consumption means any person should consume not more than one meal per week of such fish and persons of high risk such as pregnant women, nursing mothers, women of child bearing age and young children, should not eat any such fish taken from the designated regions.

Very Limited Consumption is the same as above except to further restrict consumption to no more than one meal per month.

#### PREPARATION SUGGESTIONS TO REDUCE EXPOSURE TO CONTAMINANTS

#### FISH

- Remove belly flaps, backstrap and lateral-line tissue prior to cooking.
- 2) Brotl on elevated rack; boil in water; can fish without skins.
- 3) Never use the liquid which contains oils and lats as a food item.
- 4) Avoid coatings which hold in oils or fats.

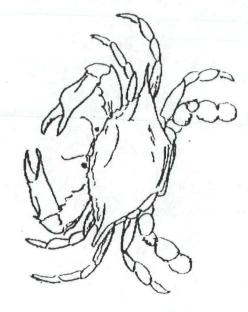
#### **BLUE CRABS**

With Blue Crabs chemical contaminants are usually found in much lower concentrations in the meat (claw and body muscle) than in the internal organs. Highest levels are found in the hepatopancreas, commonly known as the tomalley, green gland or mustard. This should not be eaten and it is best to remove it before cooking so as not to contaminate the meat during the cooking process.

The hepatopancreas is the yellowish green portion of the digestive system under the gills and can be removed with the gills prior to cooking.

If the crab is cooked whole, be certain to discard the cooking water and not to use the water or hepatopancreas (mustard) in any juices or sauces to be eaten.

This article draws from previously published information developed by the Diotsion of Science and Research. For more detailed data on history, health effects, etc., write to NJ DEPE, Div. Science & Research, CN409, Trenton, NJ 08625.



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Grounds of Rarifan Bay, Sandy Hook Bay and Delaware

Ratitan Bay and Sandy Hook Bay



# New Jersey Department of Environmental Protection Division of Fish, Game and Wildlife Marine Fisheries Administration Bureau of Marine Fisheries Bureau of Shellfisheries

October, 1988

New Jersey's
Recreational and Commercial Fishing Grounds
of
Raritan Bay, Sandy Hook Bay
and
Delaware Bay

by William Figley

and

The Shellfish Resources of Raritan Bay and Sandy Hook Bay

by Thomas McCloy

Charts by Barry Preim

New Jersey Department of Environmental Protection
Division of Fish, Game and Wildlife
Marine Fisheries Administration

Thomas H. Kean, Governor
Richard T. Dewling, Commissioner, Environmental Protection
George P. Howard, Director, Fish, Game and Wildlife
Bruce L. Freeman, Administrator, Marine Fisheries

#### MARINE FISHERIES COUNCIL

Jack Meyer, Chairman Fenton Anderson William Bowen Axel Carlson Robert Egnatovich Everett Giberson Robert Lick Charles McCullough Robert Morgan Stella Patterson Joseph Platoni

Financial assistance for this report was furnished by the Commercial Fisheries Research and Development Act (P.L. 88-309) administered by the National Marine Fisheries Service and from the Coastal Zone Management Act.

Technical Series 88-1

Marine Fisheries Administration, CN 400 Trenton, NJ 08625

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# **ACKNOWLEDGMENTS**

This project was supported in part with funds from the Commercial Fisheries Research and Development Act (P.L. 88-309) which is administered by the National Marine Fisheries Service. The remaining funds were provided by the State of New Jersey. Richard Seagraves and Ronald Smith of the Delaware Division of Fish and Wildlife furnished information regarding the fishing grounds for Delaware's portion of Delaware Bay, Bruce Freeman, Paul Hamer, Bruce Halgren, John Makai, Donald Byrne, Joseph Dobarro, Diana Jones and Peggy Andrews of the Marine Fisheries Administration assisted in the preparation or review of the text. Cover photo by Hank Wurzberger.

The shellfish inventory of Raritan and Sandy Hook Bays was funded in part by the Commercial Fisheries Research and Development Act (P.L. 88-309) and funds from the Coastal Zone Management Act of 1972. The remaining funds were provided by the State of New Jersey.

James Joseph, Leo Jennings, Thomas Baum. Jr. and Paul Kraus, all of the Bureau of Shellfisheries, participated in various phases of sampling and data analysis. Barry Preim of the Bureau of Marine Fisheries was responsible for the preparation of the shellfish resource charts.

Most of the credit for this publication lies with the nearly 200 recreational and commercial fishermen who provided the information contained within this report. Without their help and knowledge, this work would not exist. They are listed by embayment.

R. Fisler, Jr.

K. Ignotis

L. Layton

E. Mosinak

A. Klein

#### RARITAN BAY AND SANDY HOOK BAY

#### Recreational J. Adams E. Aras F. Azzollini D. Bennett R. Blashfield W. Bontemps T. Brown S. Callari D. Christensen A. Cimilluca E. Freer J. Freidman R. Giessuebel G. Graf J. Graf M. Grecco S. Green J. Gould H. Hagaman A. Hilliard V. Hockenbury G. Hoffman R. Jakub R. Kantor K. Kaulfers

K. Kjellberg

J. Krajewski R. Leyner

J. Lipton

P. Maresca

M. McLean

F. Morenz

T. Matulewicz

J. Klaczkiewicz

W. Morse
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L. Nvves-Vais
T. Oberlerton
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R. Van Reed
J. Vena
R. Wallenstein
R. Walsh
J. Wilkinson
J. Wood
Commercial
K. Baumle
D. Bigelow
W. Braun

F. Brink

H. Brink

E. Fisler

J. Caplinger

R. Caplinger

E. Fisler, III

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J.	Cobb
F.	Couch
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D.	Douglass
A.	Dulinski
J.	Eagan
	Gandy
L.	Haubois
	Heineman
A.	Heizman

L. Doneison, Jr.
A. Dowe
G. Downs
F. Franklin
N. Franklin
C. Givens
C. Goldmark
D. Harbison
P. Hank
J. Hayes
H. Henderson, III
N. Hoffman
P. Homick
C. Jack
R. James
G. Kumor
R. Laudeman
R. Malinowski
F. McBride
B. Palmer
L. Perry, Sr.
J. Phrampor
L. Peterson
S. Riley
J. Rust
L. Streeper
L. Veach
C. Walzer
C. Wettstein
G. White
T. White
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G. Carlson

C. Clark

S. Crane

E. Dawson

E. Anderson

J. Bailey, Jr.

S. Blizzaid

C. Bragg

# New Jersey's Recreational and Commercial Fishing Grounds: of Raritan Bay, Sandy Hook Bay and Delaware Bay

# INTRODUCTION

New Jersey's two largest empayments. Raritan Bay and Sandy Hook Bay in the north and Delaware Bay at the southern end of the state, contain important fishing grounds for a large number of recreational and commercial fishermen. In addition to providing important fisheries, there are other uses of the resources of these bays. Shipping requires the maintenance of deepwater channels and the disposal of massive quantities of dredge spoil. The mining industry has an interest in sand deposits for fill material and building aggregates. Various industries and municipalities use the bay water for treatment and dilution of wastes and for cooling water. Unfortunately, many of these uses often adversely affect the fish and shellfish resources. commonly referred to as the living marine resources. by degrading their living space and thereby reducing their populations. Also, because of our carelessness in disposing of toxic chemicals, we contaminate many seafood species. These and other uses of our coastal waters can directly affect fishermen by disrupting or

preventing fishing operations.

Unfortunately, during the past, exploitation of the physical resources of these large embayments has been done with little thought given to the fishery resources or the fishermen who depend upon them. Now, however, all proposed resource development activities are subject to the process of environmental review. This process has greatly reduced many of the negative effects.

Information regarding the location of fishing grounds is needed to protect both fish and shellfish resources and the fishermen that derive their recreation or livelihood from them. The recreational and commercial fishing grounds of New Jersey's ocean waters were described in "New Jersey's Recreational and Commercial Ocean Fishing Grounds" (Technical Series 81-1). This report is a continuation of our mapping efforts and presents the fishing grounds of Raritan Bay, Sandy Hook Bay and Delaware Bay.

# **METHODS**

The fishing grounds of Raritan Bay, Sandy Hook Bay and Delaware Bay were determined through a survey of commercial and recreational fishermen from New Jersey and Delaware. Although some fishermen were contacted in person, most were mailed survey forms and charts. Our list of commercial fishermen was derived from commercial fishing licenses. Party and charter boat captains were selected from our statewide list. Names of other recreational fishermen were obtained from fishing clubs, bait shops and the suggestions of other anglers.

Fishermen were requested to delineate specific areas they fished during the past five years by each type of fishing gear, in the case of commercial fishermen, and by species, in the case of recreational fishermen. The completed charts were then analyzed in two ways. First, the irregular outlines of delineated fishing grounds were transferred to master charts, one for each species or gear type. When completed, these charts depicted the entire area fished by species or gear type for all the fishermen surveyed. Survey charts were then analyzed quantitatively by overlaying each chart with a grid and tallying each grid block that was covered by any portion of a delineated fishing ground.

The grid size was 1.25 minutes square (latitude) for Raritan Bay and Sandy Hook Bay and 2.5 minutes square (latitude) for Delaware Bay. Separate tallies were kept for each type of gear and species. The highest scoring grid blocks were designated as primary fishing grounds for each particular gear or species, and the lower scoring blocks were designated secondary fishing grounds. However, in preparing the final composite charts, only the irregularly-shaped outlines obtained from the first transfer were plotted. This was to insure that only that portion of a grid block that was actually fished was plotted.

It should be noted that these charts show the fishing grounds and not the distribution of each species. Fishing grounds represent only a portion of the geographic range of a species. Their extent is often limited by factors such as the density of fish, the suitability of an area for fishing, depth, regulations, pollution and distance from port. Furthermore, the charts depict only primary and secondary fishing grounds, areas where the majority of recreational and commercial fishing occurs; they do not include areas where rare or infrequent catches are made or where a species is taken as a bycatch of another species. In addition, fishing ground

coundaries are not permanent. Fishing effort adapts to changes in fish distribution and the location of grounds can vary from year to year. The information contained on these charts must therefore be considered in the context of time. Also, it must be recognized that aithough the survey included a large and diverse sample of New Jersey's recreational and commercial fishermen, not all fishermen were interviewed. Therefore, some actively fished areas may have been omitted.

The cnarts of Raritan Bay and Sandy Hook Bay incicate the fishing grounds of only New Jersey fishermen. The charts of Delaware Bay depict the fishing grounds of fishermen from both New Jersey and Dela-

ware. Commercial fishing activities in Delaware Bay are greatly influenced by the state boundary line, which generally follows the shipping channel near the middle of the bay. Commercial fishermen are, for the most part, restricted by licenses and regulations to their respective sides of the bay. Thus, the commercial fishing grounds of New Jersey and Delaware fishermen depicted on the charts are exclusive. In the case of recreational fisheries, there are no area restrictions and anglers from both states mix over much of the fishing grounds. The areas on the charts labelled "Delaware Only" are fished only by Delaware anglers, because they lie too far across the bay for New Jersey anglers to reach.

# PHYSICAL CHARACTERISTICS OF THE BAYS

# Raritan Bay and Sandy Hook Bay

Raritan Bay and Sandy Hook Bay is a triangularshaped embayment measuring nine by twelve miles and has a surface area of 109 square miles. It receives freshwater inflow from several drainage systems including the Hudson, Passaic and Hackensack Rivers to the north, the Raritan River to the west and the Navesink River to the south. The Bay system is divided between New York and New Jersey. Two shipping channels lead into the bays. Starting at the seaward edge, Ambrose Channel cuts northward under the Verazano Narrows Bridge to New York Harbor and the Hudson River. Sandy Hook Channel enters at the tip of Sandy Hook and proceeds westward to Perth Amboy, the Arthur Kill and Raritan River, Chapel Hill Channel joins these two main channels in a north-south direction. Except for the shipping channels, most of Raritan Bay and Sandy Hook Bay is relatively shallow, usually less than 20 feet in depth. Tides enter and leave the bay in a counter-clockwise gyre. Flood tides bring higher salinity ocean water in through Ambrose Channel that flows along the New York shores. Ebb tides drain less saline waters from the New Jersey shore out to the ocean through Sandy Hook channel. The volume of the tidal prism is 9.2 billion cubic feet and the mean tidal range is 5.5 feet.

The shores of Raritan Bay and Sandy Hook Bay and the numerous rivers, streams and tidal creeks that flow into them are the most highly industrialized and urbanized in New Jersey. Industrial and sewage effluents and storm-water run-off have resulted in severe water pollution and fish contamination, particularly in the northern drainage systems. Fortunately, public efforts and laws to reduce pollution are leading to improved water quality. As a result, blue crabs, striped bass, bluefish and other marine organisms are returning to many areas, such as Newark Bay and the

Hackensack River, where they have been absent for decades.

#### Delaware Bay

Delaware Bay is 46.7 miles long and has an average width of 15.3 miles. It has a surface area of 720 square miles and a volume of 4.7 trillion gallons. Although the major source of freshwater is the Delaware River. scores of tributaries, from narrow tidal creeks to small rivers, enter from both the Delaware and New Jersey shores. Each day, an average of 13 billion gallons of freshwater reach the bay from the Delaware River and the various tributaries. Tidal influence is much greater however, with over a trillion gallons of seawater entering the bay daily. Tidal circulation follows a counterclockwise pattern. Entering seawater tends to follow the New Jersey shore and tidal water mixed with freshwater tends to exit along the Delaware shore. For this reason, the Delaware side exhibits much greate variations in salinity. Tides extend from the mouth o the bay, where the mean range is 4.1 feet, to as faupstream as Trenton Falls, where the mean range is 6.8 feet.

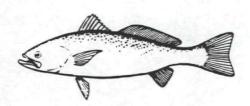
About 80 percent of Delaware Bay is less than 30 fee deep. The shipping channel, with depths of 40 to 60 feet, runs close to the center of the bay and is bordered on each side by shoals only 6 to 20 feet deep. A deep water area on the Delaware side of the channel neat the mouth of the bay serves as a ship anchorage, with depths of 60 feet and more. Wide shoals less than 1: feet in depth border both the New Jersey and Delaward shores. One large shoal extends from Egg Island Point to Cape May Point. Another set of shoals, called The Rips, extends out from Cape May Point partially across the mouth of the Bay.

Vast stretches of tidal marsh border Delaware Bay in sharp contrast to the urbanized shores of Raritan Bay and Sandy Hook Bay. Unlike the northern part of the state, there has been much less industrial or resigential development along Delaware Bay.

A 1960 study by the University of Delaware indicated that 138 species of fish can be found in the bay. Over 60 of these use the estuary as both a spawning and nursery ground. The Delaware River was once an important migratory pathway and sprawning ground for anadromous species, such as shad, herring and striped bass. Heavy municipal and industrial pollution

from Philadelphia and Camden, however, has resulted in seriously low dissolved oxygen levels during the summer. This pollution block had prevented fish in upstream portions of the river from returning to the sea. However, in the last few years, the City of Philadelphia has completed its last sewerage treatment facility and the water quality as well as the dissolved oxygen levels have increased considerably. This has allowed the shad runs to increase after a half century of reduced population levels. Unfortunately, striped bass reproduction in the river continued to remain at a low level.

# RECREATIONAL FISHERIES



## Weakfish

#### Season

The weakfish, sometimes called gray sea trout, is the primary target of Delaware Bay anglers. Weakfish enter the Bay, usually in mid-April, to spawn. As they first enter, they do not actively feed. By early May, however, feeding increases as water temperatures rise. The first wave of fish to enter the bay are old, mature fish weighing 6-14 pounds. Many leave after spawning in mid-June and migrate northward along the coast. A second wave, also of mature, but smaller fish (3-6 pounds), arrives as the first wave exits. After spawning, the second wave also departs and is replaced by a third group of immature one-year-old fish that stay until October.

In recent years, the weakfish has increased tremendously in importance in Raritan Bay and Sandy Hook Bay, where it is believed to spawn. The first weakfish are taken by anglers during mid to late June. Large fish are caught in the bay and along the oceanfront by anglers throughout the summer.

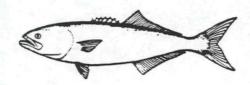
# Fishing Grounds Raritan Bay and Sandy Hook Bay

The primary fishing grounds include the areas between Ambrose. Sandy Hook and Chapel Hill Channels, between Sandy Hook and Earle Pier and the oceanfront along Sandy Hook. Secondary grounds extend further into the bay and include a large area bordering Perth Amboy Channel and another area

along the west side of Chapel Hill Channel and the Shoals surrounding West Bank Light. Another secondary ground occurs at the mouth of the bay, north and south of Ambrose and Sandy Hook Channels.

#### Delaware Bay

The primary sportfishing grounds extend from Brandywine Shoal up the bay to Cross Ledge and from Egg Island Point and Deadman Shoal to Blake and Lower Middle Channels. The secondary grounds cover most of the remainder of the bay from Arnold Point Shoal to the shoals at the mouth of the bay.



### Bluefish

#### Season

Bluefish enter New Jersey's major bays in early May. Until their departure in late October, the bluefish population is represented by one or more year classes, from young-of-the-year fish, called snappers, to 15-pound jumbos. Bluefish less than three pounds dominate the population throughout the summer.

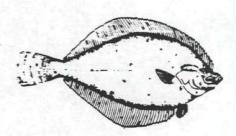
# Fishing Grounds Raritan Bay and Sandy Hook Bay

Although bluefish are caught at one time or another throughout the entire bay, the primary fishing grounds extend from the Verrazano Narrows Bridge to Ambrose Channel, encompass the large area at the mouth of the

cay bordered by Chapel Hill. Sandy Hook and Amprose Channels, and extend along the oceanfront off Sandy Hook.

#### Delaware Bay

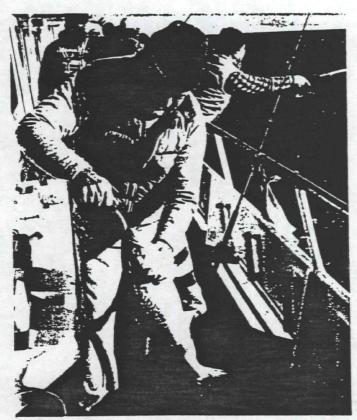
While bluefish are taken throughout the offshore portion of the bay as far uppay as Ship John Shoai, the primary grounds extend from Brandywine and Deadman Shoai up the north side of the snipping channel to Ben Davis Point Shoai.



# Winter Flounder

#### Season

Adult winter flounder enter New Jersey bays in November and remain until late April, when they return to the ocean to spend the summer. Juveniles and some

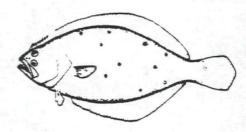


An angler unhooks a bluefish caught at the mouth of Delaware Bay.

adult fish remain in the bays throughout the year. Although winter flounder enter Delaware Bay, their numbers are relatively small, particularly in recent years, and presently do not support a sportfishery. It is, however, an important species in Raritan Bay and Sandy Hook Bay. Most fishing activity occurs during March and April. With cold water temperatures in January and February, winter flounder do little feeding and thus are rarely caught by anglers.

# Fishing Grounds Raritan Bay and Sandy Hook Bay

The primary fishing grounds extend from the Highlands Bridge along Sandy Hook to the channel and around Earle Pier. Secondary grounds include the area from Sandy Hook along the shore to Matawan Creek, the mouth of the Arthur Kill and the area between Perth Amboy Channel and Great Kills Harbor.



## Summer Flounder

#### Season

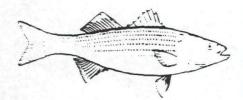
Summer flounder, called fluke in the northern par of the state and flounder in the south, enter New Jersey bays in late April or early May. They spend the summe feeding in the bays and then move into the ocean ir early September prior to their offshore migration to wintering grounds offshore as far as the edge of the continental shelf.

# Fishing Grounds Raritan Bay and Sandy Hook Bay

The primary fishing grounds include the area at the mouth of the bay between the three channels and be tween Sandy Hook and Earle Pier. Secondary ground include the large area spanning the length of State Island and the area to the west of Earle Pier on eithe side of Perth Amboy Channel.

#### Delaware Bay

The primary summer flounder fishing grounds ex tend from Brandywine and Deadman Shoals up bot sides of the shipping channel to Cross Ledge. Th secondary grounds surround the primary grounds an include the shoals at the mouth of the bay.



# Striped Bass

#### Season

Striped bass, called rock on Delaware Bay, are caught by anglers in Delaware Bay and Raritan Bay and Sandy Hook Bay between mid-April and mid-November. During the early season, stripers are found in the interior parts of the bay. As the season progresses, they seem to move towards the mouth of the bay.

# Fishing Grounds Raritan Bay and Sandy Hook Bay

The primary fishing grounds for striped bass include the area bounded by Sandy Hook and Chapel Hill Channels. Rockaway Point, West Bank, the Verazano Narrows Bridge and the beachfront along Sandy Hook. Secondary grounds include the bayfront along Staten Island and the New Jersey shore between Union Beach and Highlands, Earle Pier and the west side of Chapel Hill Channel.

#### Delaware Bay

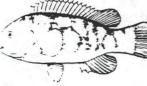
A minimal amount of fishing is directed at striped bass in Delaware Bay. Striped bass are caught at the mouth of the bay on the various shoals, collectively known as The Rips, and up the bay on shoals that border the shipping channel such as Cross Ledge, Ben Davis Point Shoal and Ship John Shoal.



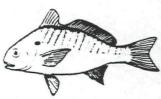
Sea Bass



Scup



Tautog



Spot

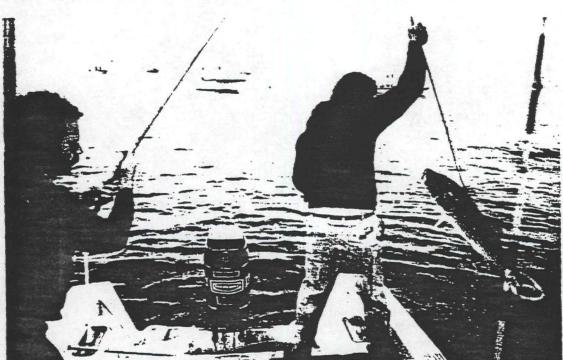


Croaker

# Sea Bass, Tautog, Scup, Spot and Croaker

#### Season

A variety of bottom fish, including sea bass, scup, spot, croaker and tautog, are caught by anglers between April and October. Spot and croaker inhabit sand, mud and shell bottoms. Sea bass, progy and tautog prefer shell and rock.



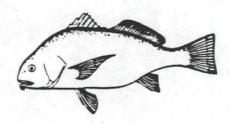
Gaffing a Sandy Hook Bay striper.

# Fishing Grounds Raritan Bay and Sandy Hook Bay

Bottom fish are found throughout the bay around natural and artificial structures such as piers, jetties, fixed channel markers, gravel bars, shellfish beds and debris. The largest areas are the Tin Can Grounds and Romer Shoal at the mouth of the bay and the shellfish beds off Union Beach. Other smaller areas include the Highlands Bridge, Earle Pier, Atlantic Highlands breakwater, the islands around West Bank, the tip of Sandy Hook. Old Orchard Shoal, the deep holes off Perth Amboy and to the west of Chapel Hill Channel.

#### Delaware Bay

In Delaware Bay, most of the bottom fishing grounds are on sand, mud or oyster shell bottom. The area surrounding Deadman Shoal has been productive for croakers. Spot are caught along the bayshore at Bidwell Creek, Egg Island Point and Fortescue. Sea bass are caught, usually incidentally to the taking of summer flounder, over a wide area, including Egg Island flats and the Punk Grounds on the New Jersey side, and from Fourteen Foot Light to the Shears on the Delaware side. Tautog are caught around artificial rock structures such as Brandywine Light and the Lewes Ferry breakwater.



# Black Drum

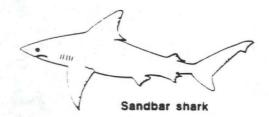
#### Season

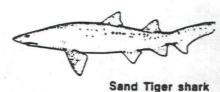
Although black drum historically were caught in the bays throughout New Jersey, they are now almost entirely restricted to Delaware Bay. Drum enter the bay in May to spawn. After spawning, they remain in the bay throughout the summer, but are most actively fished during May and early June.

#### Fishing Grounds Delaware Bay

The primary sportfishing ground for black drum is bounded by Bay Shore Channel and Deadman Shoal

on the east and Brandywine Shoal and Fourteen Fo. Bank on the west. Secondary grounds surround the periphery of the primary grounds and include severareas on the Delaware side near Old Bank Shoal are the Hawknest.





# Sharks

#### Season

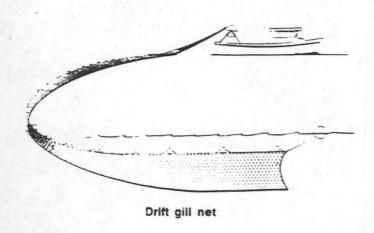
The two most common species of toothed sharcaught in New Jersey bays are the sandbar or bro shark and the sand tiger. In addition, bull sharks he occasionally been taken by sportfishermen in Delaw. Bay. Sharks enter the bays in June and stay until watemperatures begin to decline in September or Ocber. Adult female sandbar sharks use Delaware Bay an important pupping area. They usually do not feduring the time subsequent to giving birth to live you The adult males remain offshore and thus are not for in the bay.

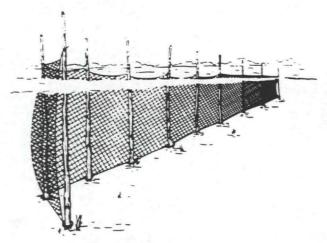
Sharks have provided a popular sportfishery in D ware Bay for over 50 years, but little fishing activity been exerted for them in Raritan Bay and Sandy H Bay.

#### Fishing Grounds Delaware Bay

The most productive shark fishing areas have be the ends or edges of deep sloughs and channels rethe mouth of Delaware Bay. There are two prinshark fishing grounds, one on the New Jersey side the Shipping Channel to the east of Brandywine Stand another on the Delaware side of the channel in anchorage. Secondary fishing grounds occur along Shipping Channel as far up the bay as Ben Davis F Shoal.

# **COMMERCIAL FISHERIES**





Staked gill net

## Gill Net

#### **Description of Gear**

Two basic types of gill nets are used in Delaware Bay, the staked or anchored net and the drift net. Staked nets are set between wooden stakes or poles that are either driven or jetted into the bottom. Anchored nets are held in position by a series of anchors. Due to strong tidal currents, staked nets are usually set in coves and shoal areas less than 15 feet deep. To further reduce drag, they are also relatively short, usually less than 180 feet in length. A lead line at the base keeps the net on or near the bottom. A float line along the top rises and falls with the tide and keeps the upper edge of the net at the surface of the water.

Drift nets are allowed to drift with the current and are usually used in water deep enough so that the lead line does not touch bottom. They are much longer than staked nets, ranging from 300 to 1,200 feet in length.

Gill nets are made of monofilament or fine nylon that is relatively invisible in the turbid bay waters. The mesh size used is dependent upon the target species. Stretched mesh of 5" or larger is used for shad, large weakfish and bluefish. Mesh of 2 3/4" or larger is used

river herring, menhaden, white perch, and small

Only staked gill nets for shad are allowed in Raritan Bay and Sandy Hook Bay and only in a limited area. On the New Jersey side of Delaware Bay both staked and drift nets are permitted. On the Delaware side, staked nets are only permitted on the oyster grounds. Elsewhere, only drift gill nets are permitted.

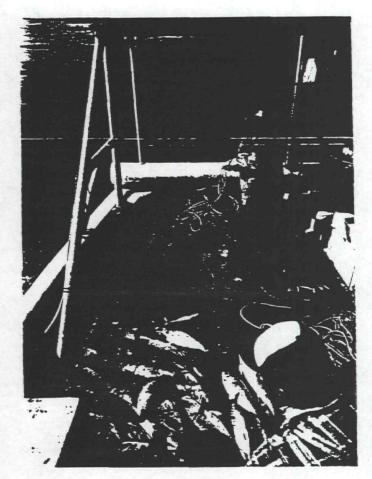
#### Season

The use of staked or anchored and drift gill nets is confined to particular seasons by law. The prescribed seasons, however, are liberal and the netting period is limited more by the availability of fish than regulation.

Staked gill nets are usually first set in late February or March, to catch shad migrating up the Delaware or Hudson Rivers to spawn. Other early species include river herring, menhaden and white perch. The herring and menhaden are sold for crab bait.

Drift netting begins with the arrival of weakfish and bluefish in mid-April. The weakfish is the moneymaker, having the highest market value of the fish caught in volume in the two bays.

Most staked nets are pulled our during mid-May due to a number of problems, including the invasion of horseshoe crabs, which create extensive net tangles and damage; warm water temperatures, which lead to spoilage of fish; and the fouling of nets with slimy algae and stinging sea nettles. The few staked nets that are fished throughout the summer are primarily intended for menhaden.



Gillnetting shad and weakfish on Delaware Bay.

Drift nets are used throughout the summer and early fall, although the greatest effort is expended during spring and early summer.

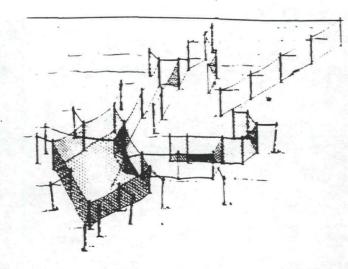
#### Methods

Staked gill netters operate anywhere from a couple of nets to 40 or more. A small number of nets can be checked by one man, but a large number requires a two-man crew. Weather permitting, nets are checked every day. To check the nets, a boat starts at one end of a row, and is hauled along from pole to pole, via the net lines. As the nets are lifted and pulled across the boat the fish are removed.

A drift net is followed and tended continuously by the fisherman. It is set in a line perpendicular to the flow of the current and may be set many times during the day.

#### Fishing Grounds

On Delaware Bay, staked gill nets are set in the shallow cove areas on the New Jersey side. The primary drifting gill net grounds here extend from the channel to the bayshore from the Cape May Canal to Egg Island Point. In Raritan Bay and Sandy Hook Bay, staked nets are confined to the nearshore area between Keyport and Port Monmouth and along Sandy Hook.



# **Pound Net**

#### **Description of Gear**

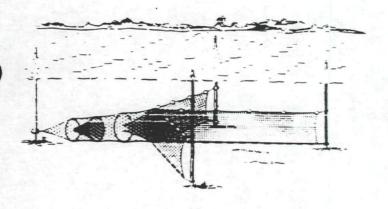
Pound nets are stationary fish traps. In Raritan Bathey have been in use for over a century. Pound ne are strung on long hardwood poles that are driven a jetted into the bay bottom. They are set perpendiculated to the prevailing shore and tidal currents to intercestish as they travel up and down the bay. When sever pounds are set in the same area they are aligned er to end to form a long continuous barrier to fish movements.

The overall length of pound nets is 500 to 750 fee A long leader (400 to 600 feet in length) consisting 9 inch stretched mesh netting acts as a barrier to moing fish. The natural tendency of fish encountering the leader is to go around the net by heading offshore deeper water. As fish move down the net, they entend the first of two heart-shaped funnels. The heart shartends to always direct the fish further into the interior of the net. Eventually, they pass through the final funrinto the square-shaped pound or holding pocket. To pocket is about 50 feet long on a side and has a refloor.

#### Season

Although in some years pound nets may be erect as early as late February, the more typical start operations is sometime during April. The season  $\epsilon$  tends through the summer into October or Novemb After fishing operations end, the net and poles  $\epsilon$  removed to prevent their loss when ice locks the t in winter.

In early spring, the catch consists of shad, herri and menhaden. Menhaden caught in pounds are so as bait for other commercial and recreational fisheri Summer catches are dominated by bluefish and wes fish. Other species taken include summer flound butterfish, northern puffer, sea bass, sturgeon and t crab.



#### Methods

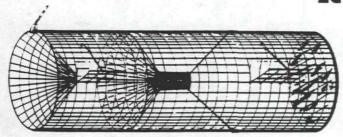
Each day, weather permitting, the nets are checked and emptied of their catch. A pound boat enters the pocket by lowering one edge of the net. The floor of the net is then raised very slowly until the fish inside are restricted to a small section of the pocket. The fishermen then ladle the catch into the boat using a long-handled dip net and a power winch.

Every two or three weeks, the nets must be taken to land for washing and drying. This process removes the algae which grows on and clogs the net. While one net is being cleaned, a fresh one is nung on the poies in its place.

#### Fishing Grounds

There are two primary pound net grounds in Raritan and Sandy Hook bays. The one in Sandy Hook Bay is located along Sandy Hook just north and west of Horsesnoe Cove. The area in Raritan Bay is much larger, extending from Earle Pier to Keyport, although the majority of nets are located to the north of Earle Pier.

### **Eel Pot**



#### **Description of Gear**

The typical eel pot is a 3-foot cylinder, 10-12 inches in diameter, made of plastic coated rectangular mesh wire with two net funnels. The funnels divide the pot into two compartments. The external one serves as a bait and entrance chamber, while the internal one is a holding chamber. Pots for catching large eels for sale as food are made with 1/2 inch by 1 inch mesh. Pots for small eels that are either salted for crab bait or held live for sportfish bait are made with 1/2 inch by 1/2 inch mesh.

#### Season

The eeling season begins in mid-April as eels emerge from their winter dormancy in the mud. Fishing continues until bay waters cool in late October. Eeling activity declines from late June to mid-August, when water temperatures get very warm and eels become difficult to keep alive in the holding pens.

#### Methods

Eel pots are set in tidal creeks or along the bayshore either individually or in small strings. They are marked with floats or stakes. Individual eelers may set and tend 50 to 80 pots or more.

Eels are kept alive in large, floating boxes or pens.

In the summer, when dissolved oxygen levels are low, aeration is often needed to keep the eels from suffocating. When a sufficient quantity has been caught, the eels are picked up by dealers who transport them live in tank trucks. The primary markets for eels are in Europe. They are packed on ice in crates and shipped overseas by airplanes.

Although surf clams and fish are used, female horseshoe crabs are the preferred bait for catching eels. Horseshoe crab fisheries have developed to supply bait for the eel fishery. In Delaware Bay, horseshoe crabs are caught in small wire pound nets that are set in shallow water along the beach. In Raritan Bay and Sandy Hook, they are caught mostly by modified crab dredges.



#### Fishing Grounds

In Raritan Bay and Sandy Hook Bay, eels are caught in the tidal creeks and along the bayshore during the cooler months of spring and fall. During the warm summer months, pots are set along the edge of Perth Amboy Channel.

In Delaware Bay, eels are caught in the tidal creeks and a 1/2 mile wide strip along the entire bayshore; during October, pots are occasionally set as far offshore as 2 miles. Pots are also set along the shipping channel in the upper reaches of the bay during mic summer.

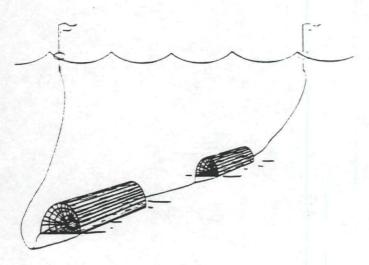


Commercial fishermen tend a pound net in Raritan Bay.

# Lobster

#### Description of Gear

The typical New Jersey lobster pot is a rectangular box made of oak lathe with a pair of net entrance funners. Depending on the preference of the fisherman, pots either have flat or rounded tops. A lobster pot has two compartments, with a net funnel leading into each. The initial one is for entry and bait and the second is for holding the catch. Wooden doors or flaps permit



access to bait and to empty the pot. The pots are tarred to preserve the wood and netting; bricks are secured to the bottom for ballast.

#### Season

In the bays, lobstering begins in mid-June, extends through the summer and has a final spurt in October before the fishery drops off.

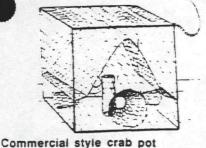
#### Method

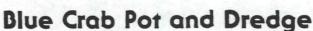
Lobster pots are set in strings of 6 to 25 pots, each connected to a main line. Flag buoys, marking the location of the pot string, are attached to each end of the main line. Pots are baited with menhaden or scraps of fish.

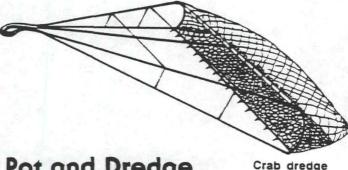
#### Fishing Grounds

In Raritan Bay and Sandy Hook Bay, lobster pots are set along the edges of Ambrose, Sandy Hook, Chapel Hill, and Perth Amboy Channels and in the deep holes west of Chapel Hill Channel:

In Delaware Bay, lobstering is restricted to Delaware fishermen in the area around the breakwater at Lewes. Delaware.







# escription of Gear

Blue crabs are harvested commercially with pots in ne warmer months and with dredges in the winter. The pical Delaware Bay crab pot is a 2-foot cube contructed of galvanized, hexagonal weave hardware tioth. The pot consists of an upper chamber or parlor or noiding crabs and a lower chamber which has 2 to 4 entrance funnels and a bait cylinder. Four paddies of cement or asphalt are attached to the bottom of the pot for weight. Some crabbers tar their pots to inhibit corrosion and add zincs to retard electrolysis. Pots are set individually in lines or circles and are marked with numbered floats. Crab pots are baited with menhaden, terring or other fish scraps.

b dredges have steel frames and either chain link, wire or net bags for collecting the catch. The front of the dredge is equipped with teeth that scrape a few inches into the sand or mud bottom and lift out the crabs buried there. Each boat usually drags two to six dredges simultaneously. The larger boats are equipped with hydraulic winches that pull the dredges up to the boat and out of the water. The maximum dredge size permitted in Raritan Bay and Sandy Hook Bay is a 75 inch wide bar with 6 inch teeth.

#### Season

Blue crabs emerge from their overwinter stay in the mud in April as water temperatures increase. The potting season usually begins in late April or May and lasts



Baiting crab pots

until early November when cold water temperatures send the crabs into the mud again. Shedder crabs are mostly caught in June in pots. The dredge fishery extend from December through March.

#### Methods

In Delaware Bay, individual crabbers operate lines of 100 to 300 pots. Weather permitting, the pots are checked every day. Crab potting is typically a two-man operation. One man operates the boat and pulls, empties, re-baits and re-sets the pots, while the other man sorts and puts the catch into bushel baskets.

The pots are moved periodically to follow the movements of the crabs. The typical seasonal pattern of the blue crab includes a general inshore movement to the bayshore and tidal creeks during the spring and an offshore migration to deeper, saltier waters during late fall.

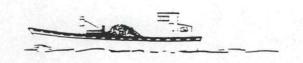
#### Fishing Grounds

On the New Jersey side of Delaware Bay, the primary potting grounds extend from Fishing Creek on Cape May up the bay to Oldman's Creek. Most fishing activity occurs within a mile or so of the bayshore and in the tidal creeks legally open to crabbing. At times, pots are set further offshore, to the edge of the shipping channel in the upstream portion of the crab grounds.

On the Delaware side, the bayward edge of the crab potting grounds is the Misipillion River. The majority of activity occurs nearshore, but at times pots are set as far as five miles offshore.

The blue crab dredging grounds in Delaware Bay are located in the deeper waters surrounding the shipping channel near the mouth of the bay. Blue crabs prefer mud bottoms in the deeper sections of the bay for overwintering. Crabs avoid oyster shell bottom, which is fortunate for crabbers, since these areas are legally off limits to crab dredging. In years when concentrations of wintering crabs are low, there is little or no dredging effort.

In Raritan Bay and Sandy Hook Bay, the dredging grounds extends from the Raritan River to the mouth of the bay in depths usually exceeding 12 feet. They include the areas on either side of Perth Amboy and Chapel Hill Channels and Sandy Hook Bay.



# **Oyster Dredge**

#### Description of Gear

Oysters are harvested with large steel-frame dredges, up to 54 inches across the tooth-bar, that are towed across the bottom. A steel, ring-mesh bag on the back of the dredge holds the catch until it is lifted hydraulically and dumped on deck. Although oysters are now harvested under power, most of the boats in the fleet were formerly sailing dredge boats that were converted to power when it became legal in 1945.

#### Season

Oysters may be legally harvested from all leased grounds between September and June. Since 1975, summer harvest has been permitted on leased areas below the Southwest line. Oyster seed is transplanted from state-owned beds to leased grounds during "Bay Season", in May and June.

#### Methods

Oyster culture begins with the transplanting of seed from state seed beds to leased ground in late spring. Seed oysters are allowed to grow on leased ground until reaching harvestable size. The peak market and harvest of oysters occurs during the fall holidays, between Thanksgiving and Christmas.

Oysters are scraped from the bottom with dredges. After the catch has been dumped on deck, fishermen cull the live oysters from shell and other debris. Culling was formerly done by hand, but most boats now use mechanical culling devices.

The day's catch is taken to processing houses in Port Norris and Bivalve where the oysters are either packed live in boxes and shipped to market or shucked and further processed. Shucked oysters are either packed fresh in tins or breaded and frozen before being sent to market. All of the snell remaining after processing is stored for eventual return to the oyster beds. Shell material is needed to provide a suitable substrate for oyster larval attachment and thus is valuable for maintaining and increasing production on the seed beds.

#### Fishing Grounds

The importance of the oyster beds of Delaware Bay has been recognized since colonial times. Prior to the mid 1800s, the oyster industry primarily subsisted by the direct marketing of oysters from the "Natural Oyster

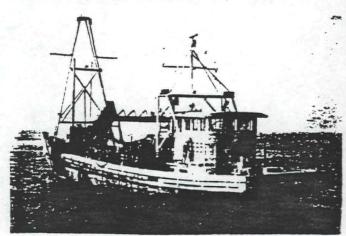
Beds". The complexion of the industry changed during the decade prior to 1850 when the oystermen realized that it was economically advantageous to "plant" and establish inventories of oysters beyond the natural beds. Oysters were neid in these planting areas until an optimum market size was reached. The oyster industry is now based upon two principal areas, the Natural Seed Beds and the Leased Planting Grounds.

The Natural Seed Beds, for the most part, occupy an area above the Southwest Line, a line of demarcation which has historically separated the planting grounds from the Natural Seed Beds. There are approximately 12,000 acres of productive seed beds and another 3,000 acres of marginally productive beds between the Southwest Line and Artificial Island. Average salinities for the seed areas range from 21 parts per thousand (ppt) at the Southwest Line to 4 or 5 ppt at Artificial Island. Water depth ranges from 5 to 25 feet.

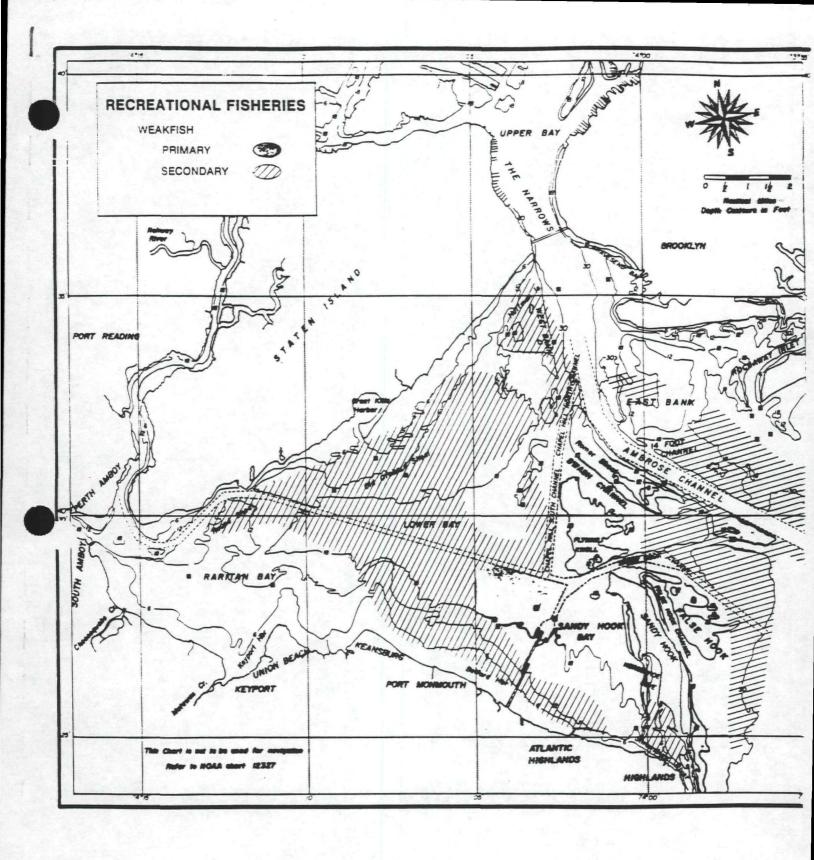
The planting grounds encompass approximately 90,000 acres, of which 29,000 acres are currently leased for planting purposes. Only a small percentage of this leased area is, however, routinely used.

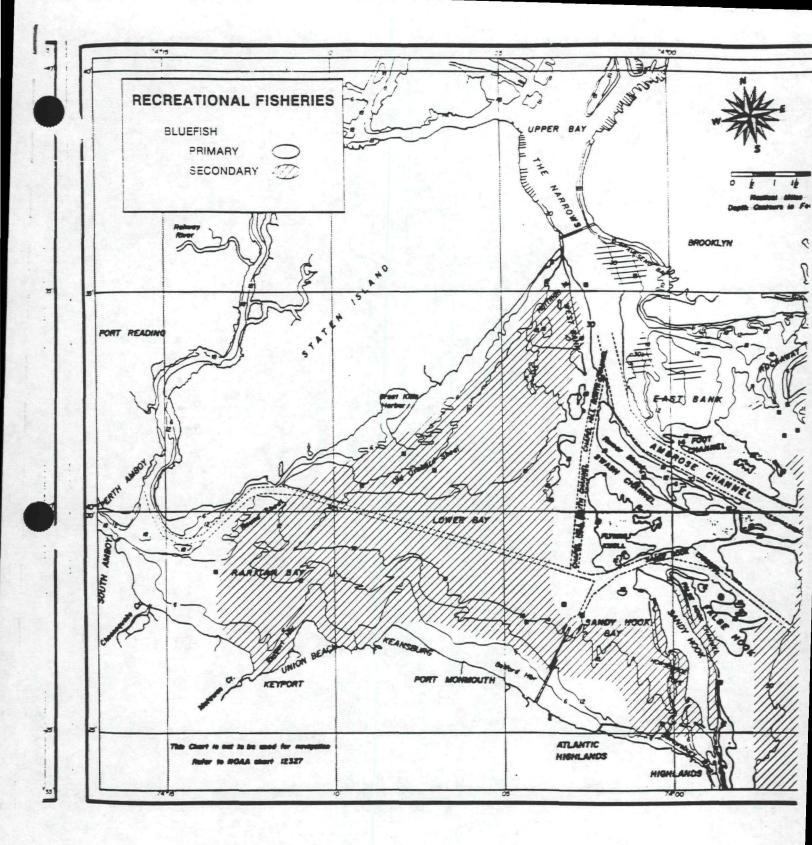
Oyster production has fluctuated, sometimes rather dramatically, throughout the recorded history of the fishery. Early estimates indicated that the annual seed harvests frequently exceeded one million bushels, with occasional higher estimates. These estimates may have been somewhat inflated, however, due to the lack of discrimination between native and imported seed stocks.

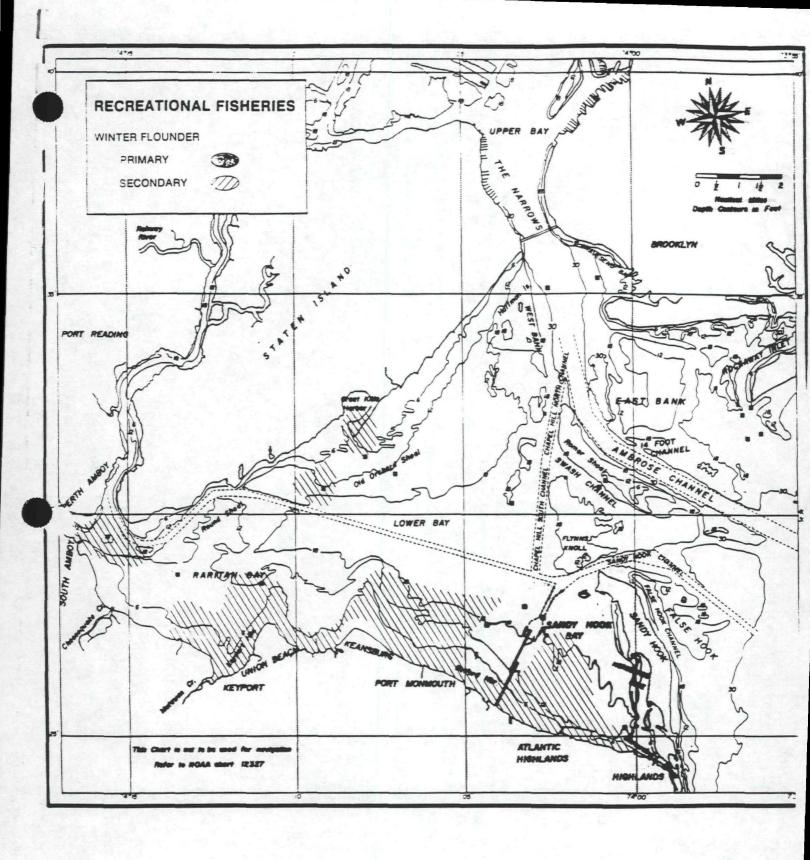
During its recent history, the industry was devastated by an epizootic parasite commonly referred to as MSX. This parasite was initially recognized in the late 1950s and was responsible for the death of oysters on the planting and, to a lesser extent, the seed areas of the bay. It was estimated that as much as 95 percent of the market bed oyster stocks were lost within three years after the onset of this oyster disease. As a result of high mortalities in these traditional oyster planting grounds, a new area of approximately 7.000 acres. located above the Southwest Line and adjacent to some of the natural beds, has been made available for planting purposes. This area has lower salinity ranges and is therefore not as affected by MSX.

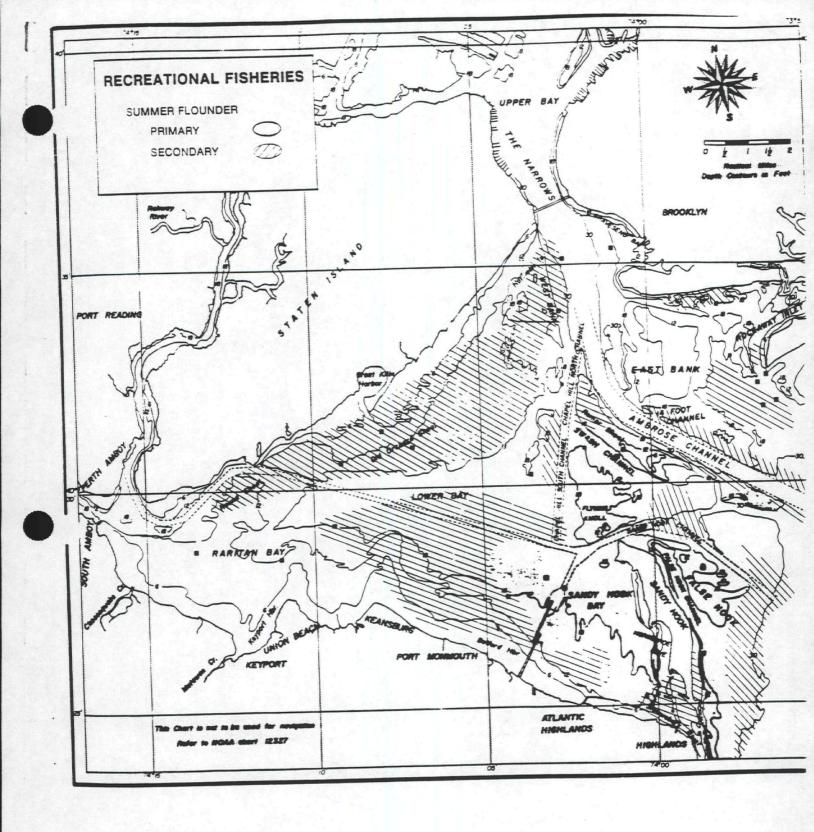


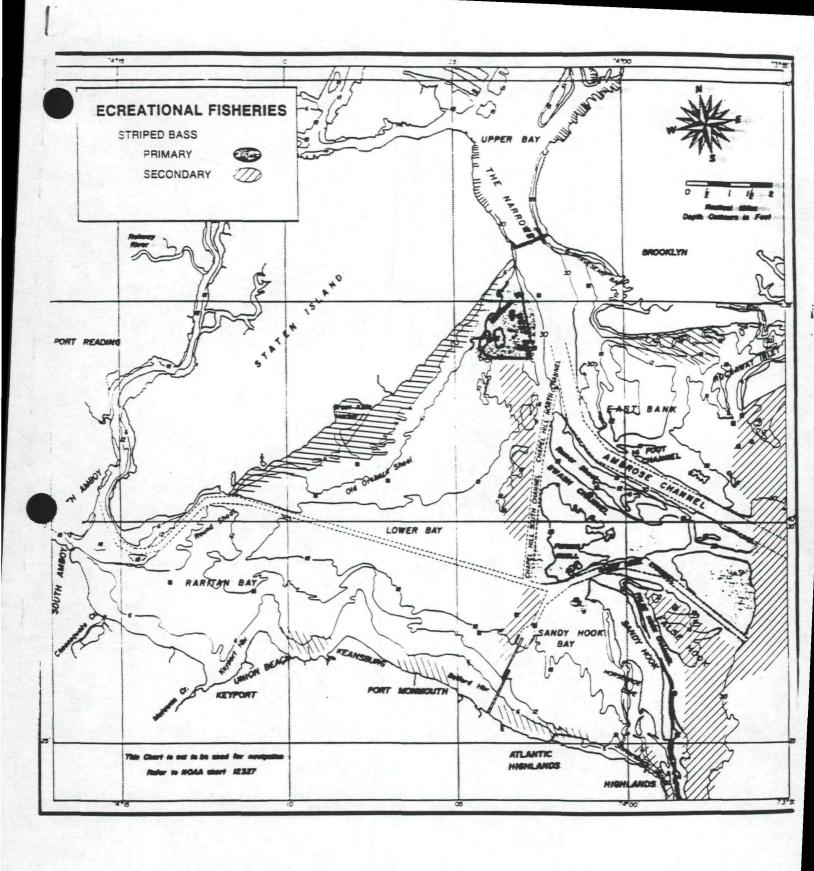
Oyster dredge boat

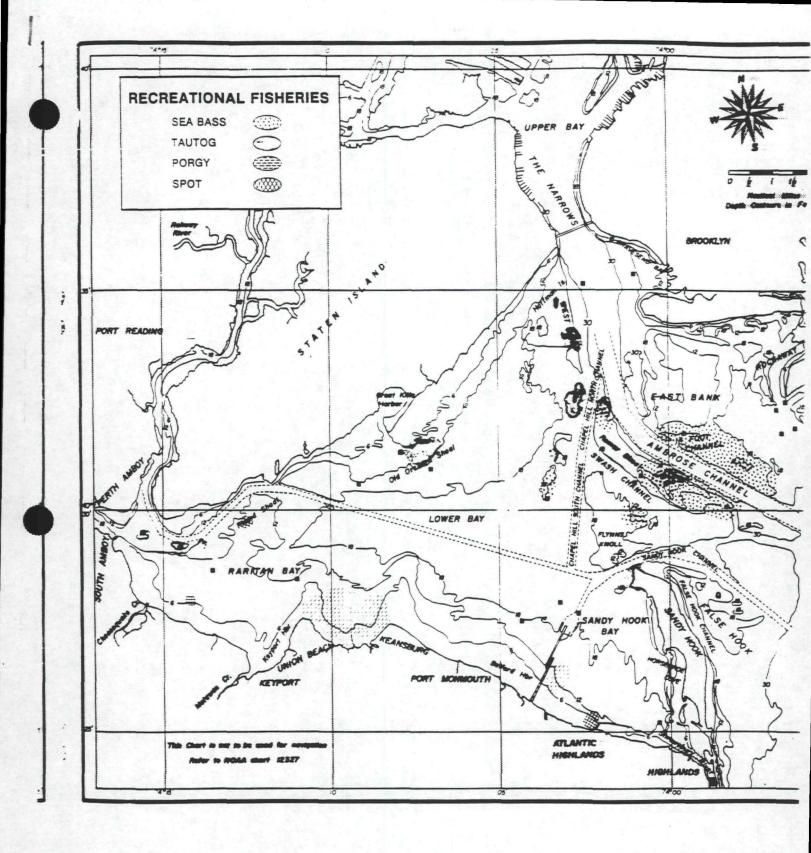


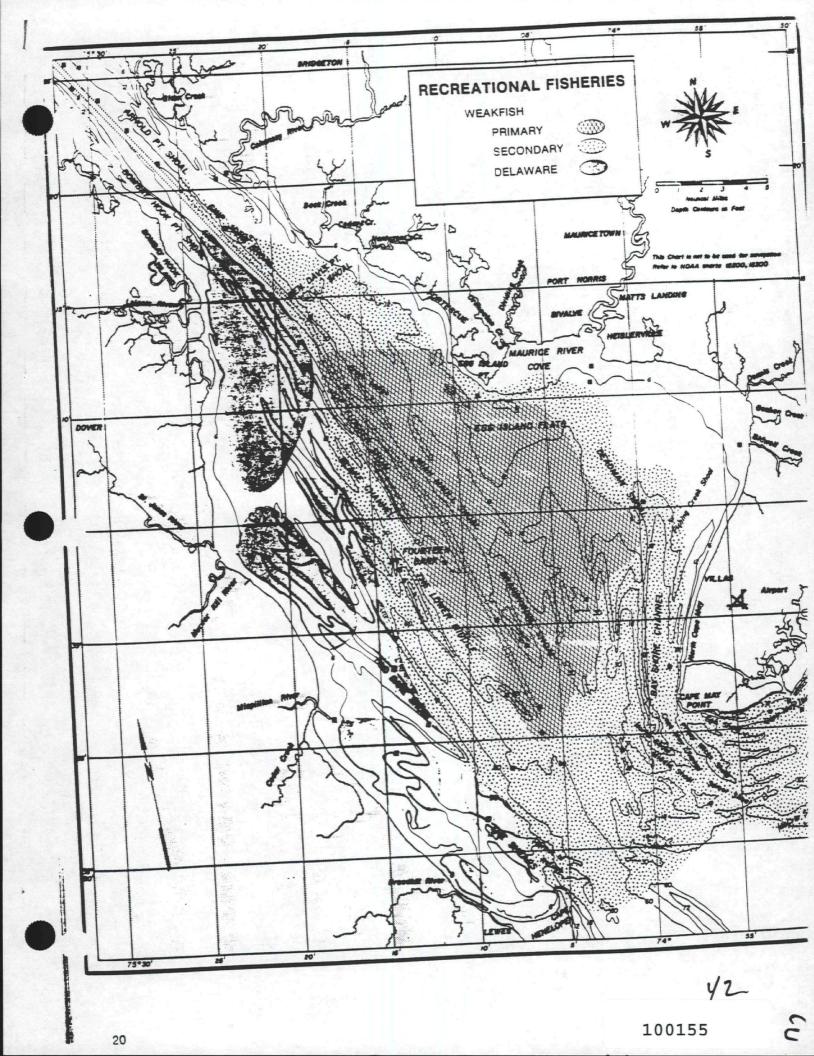


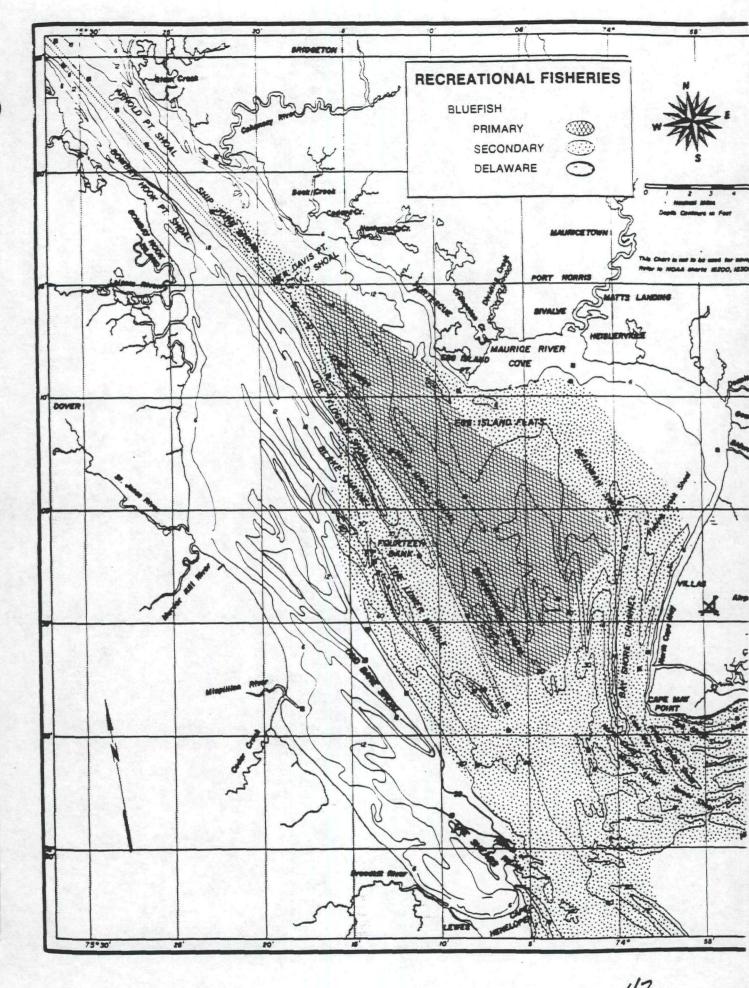


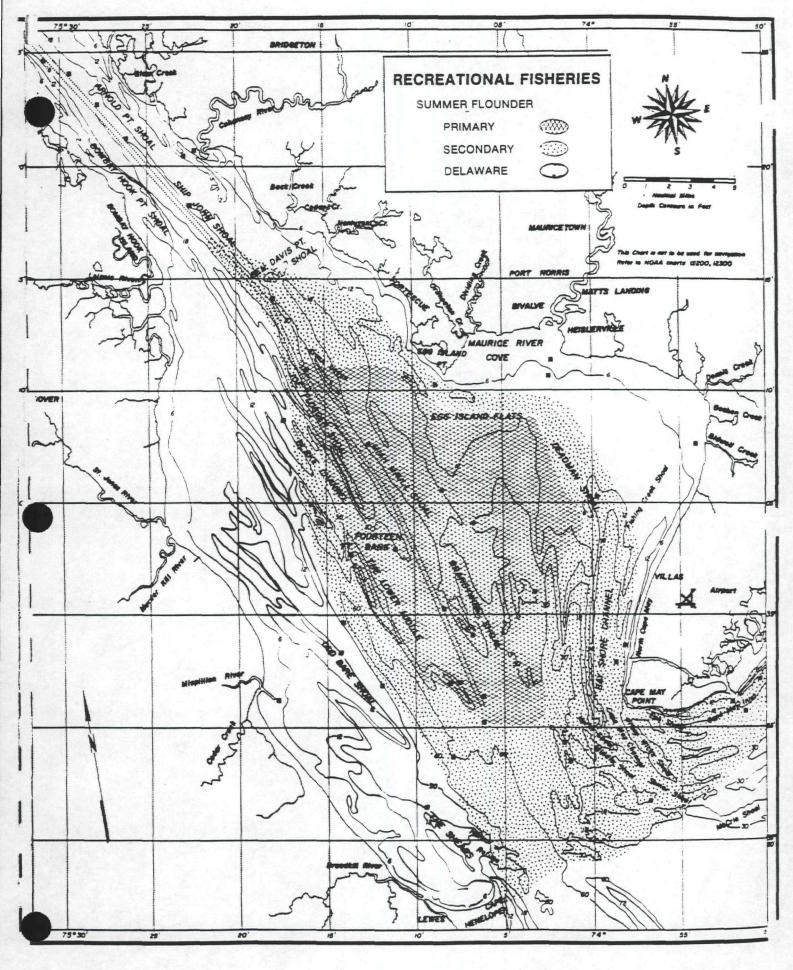


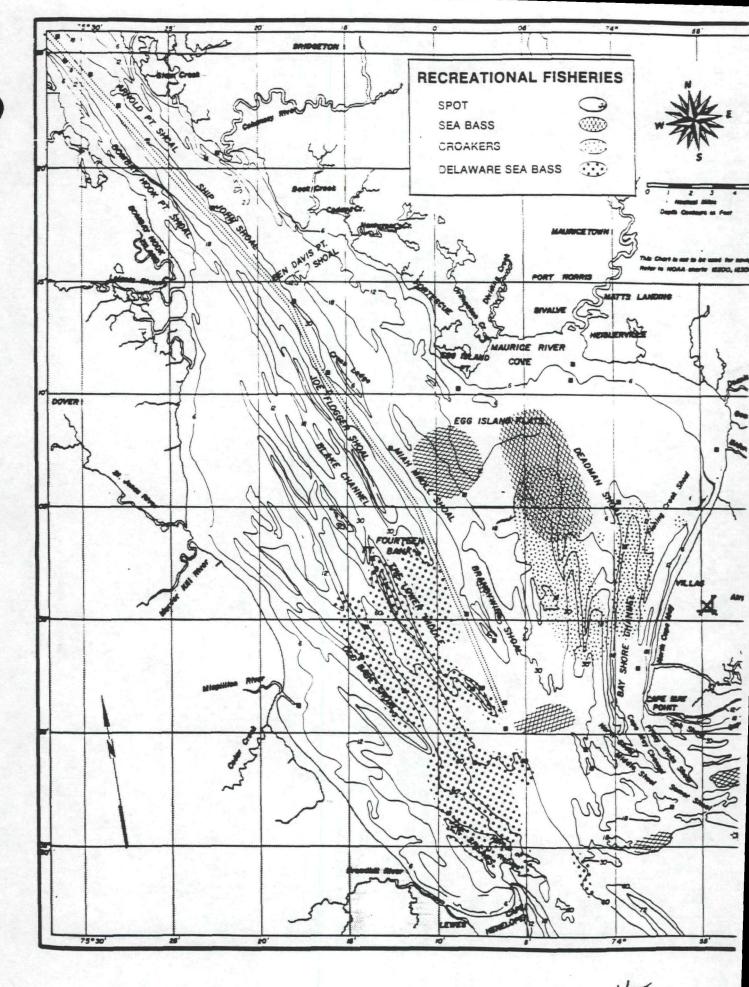


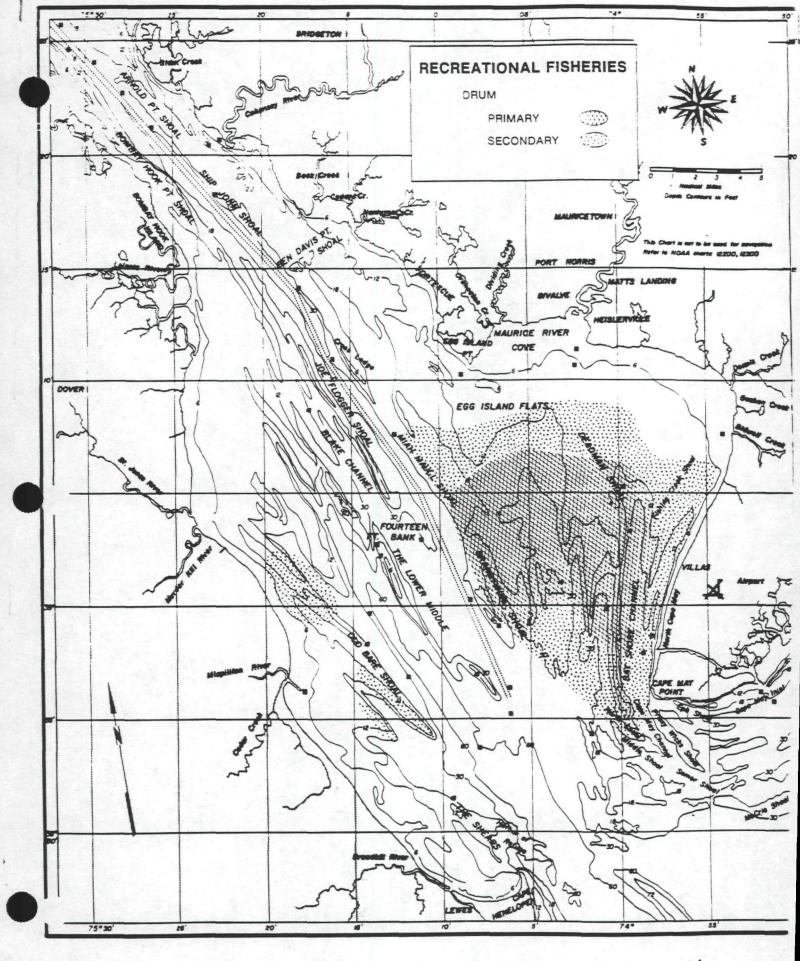


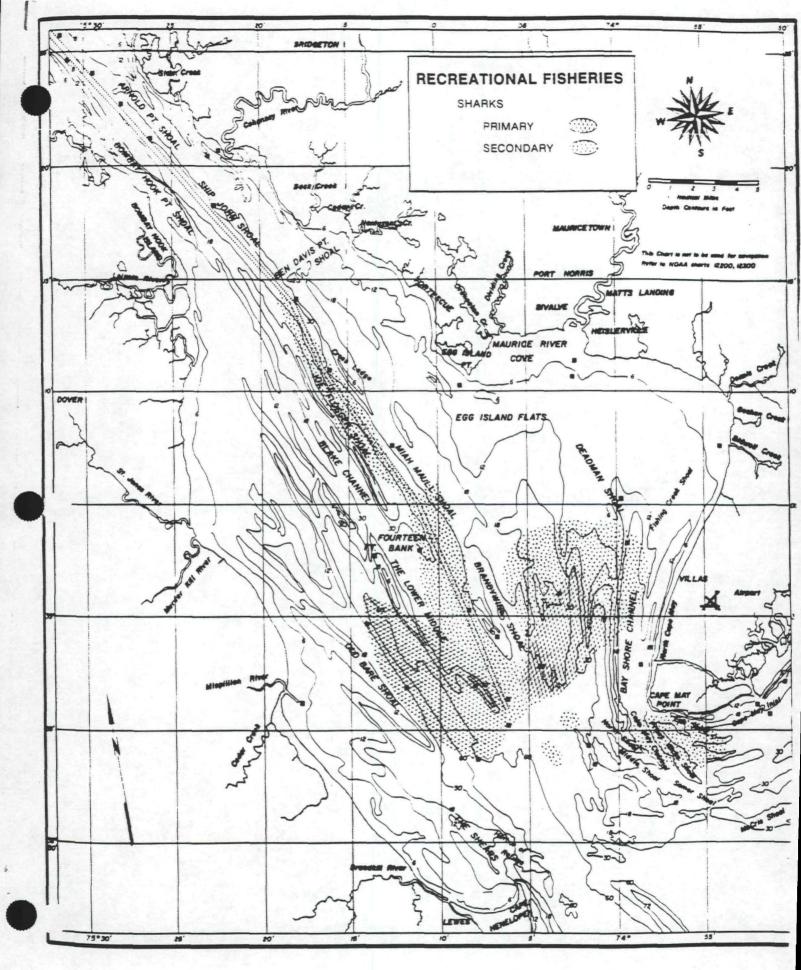


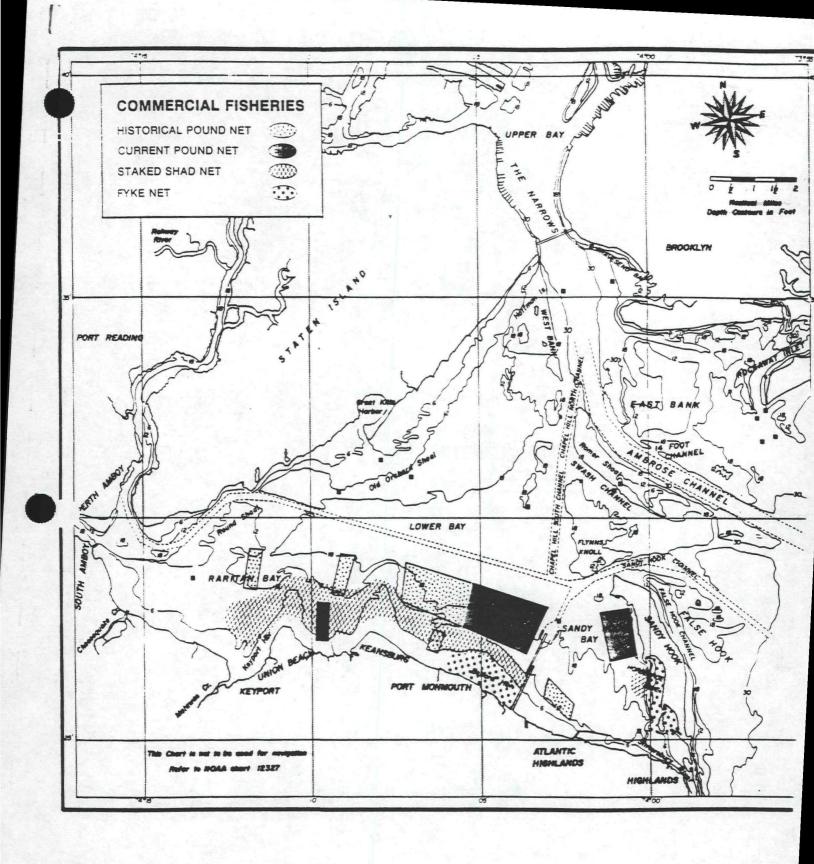


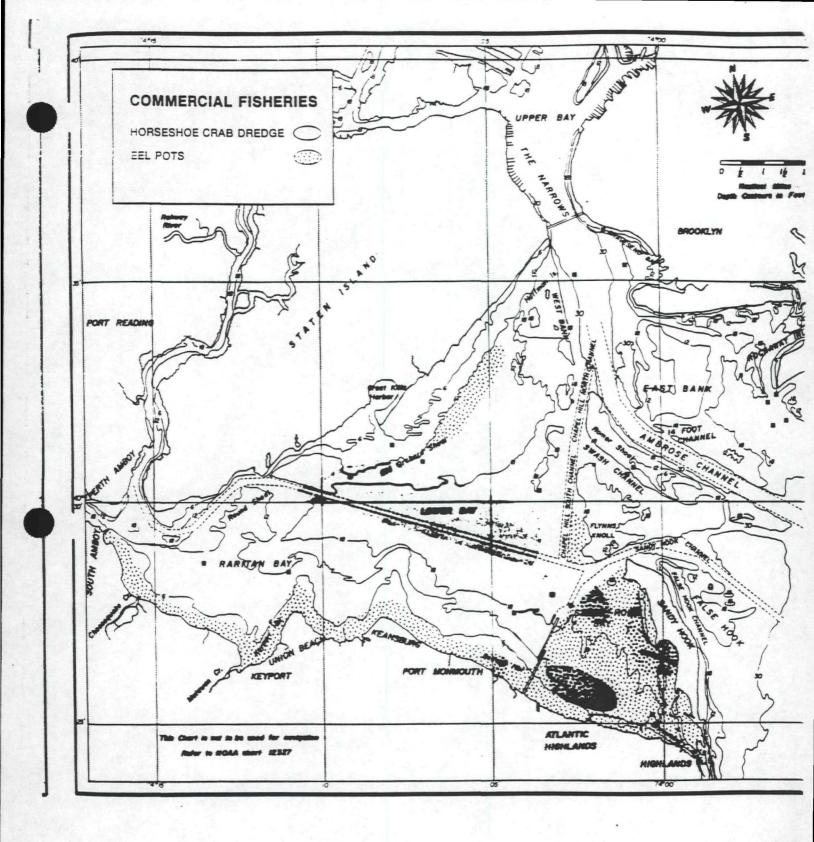


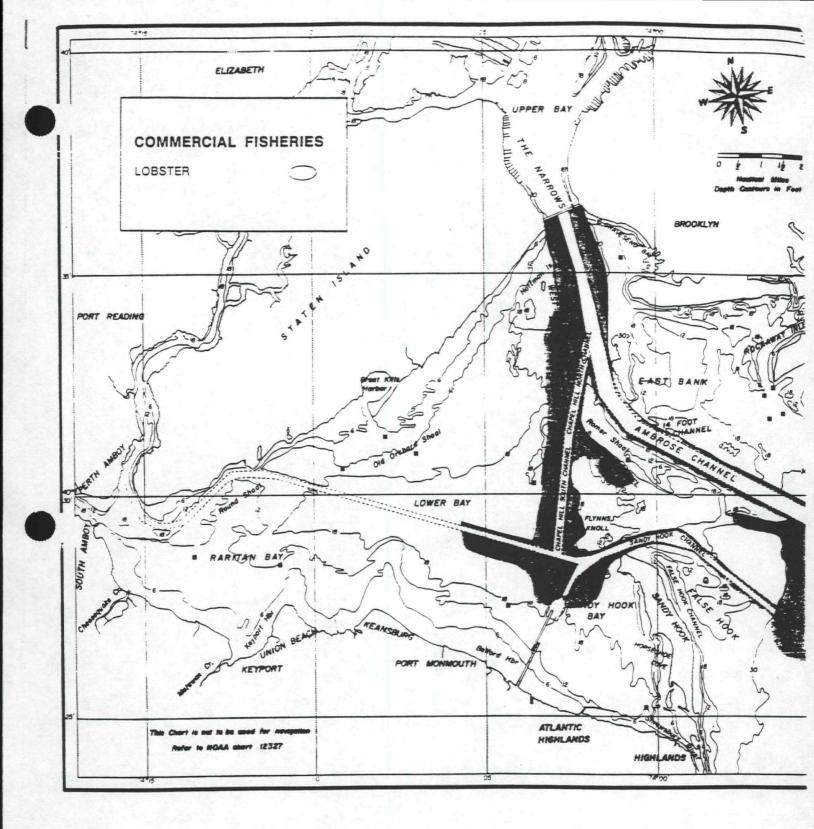


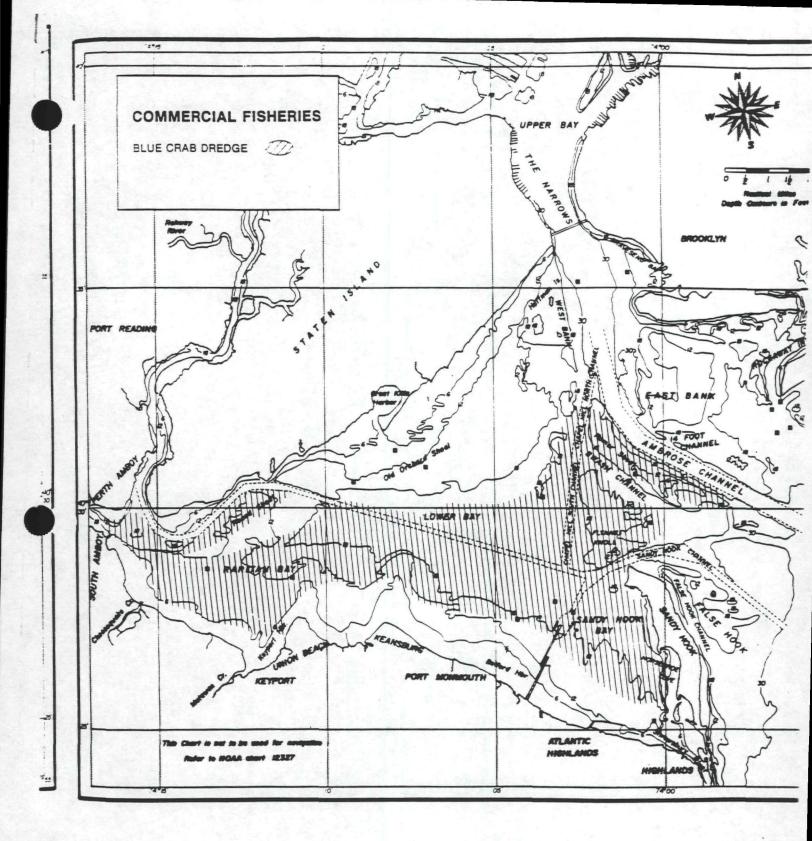


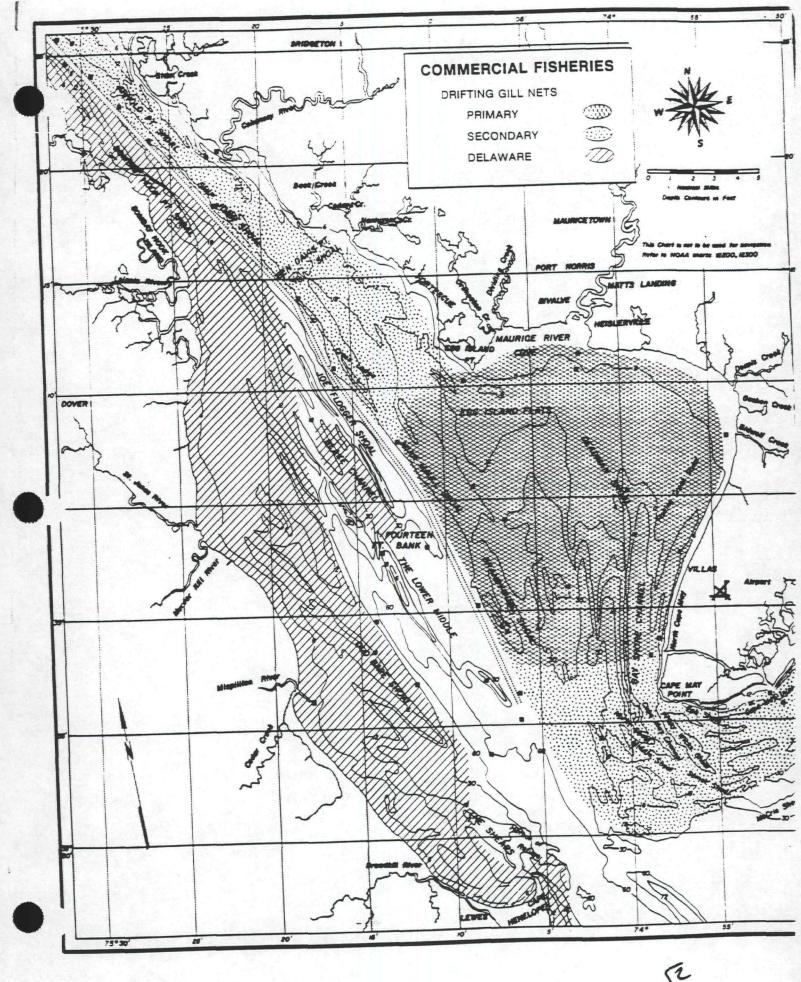


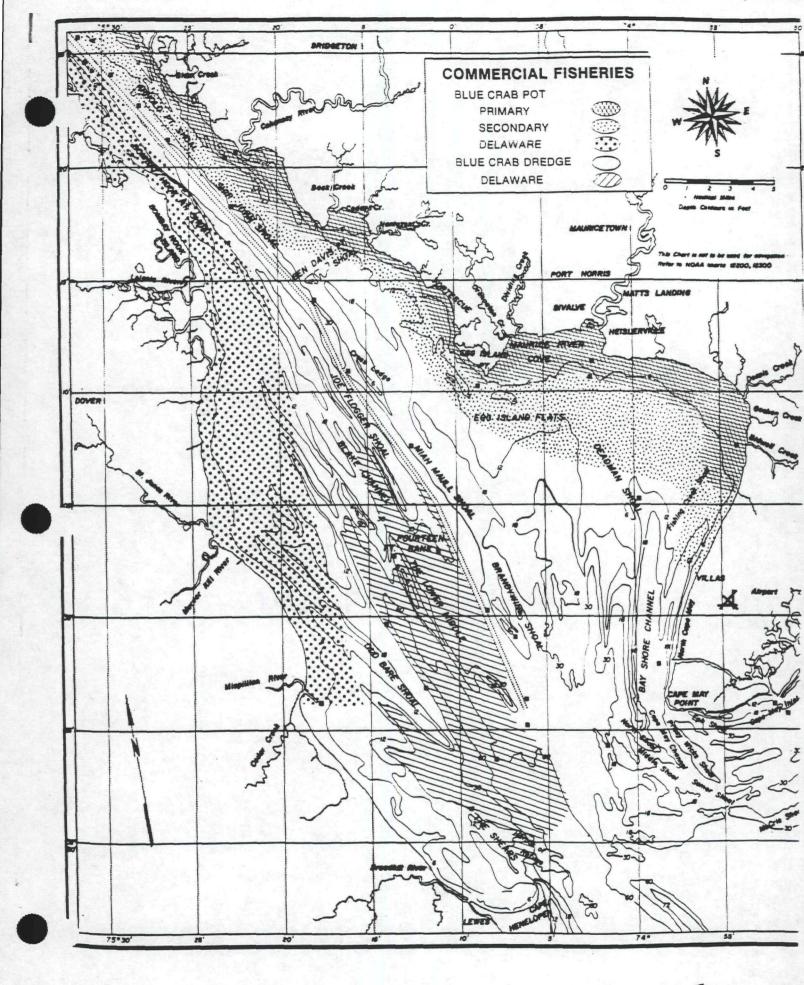


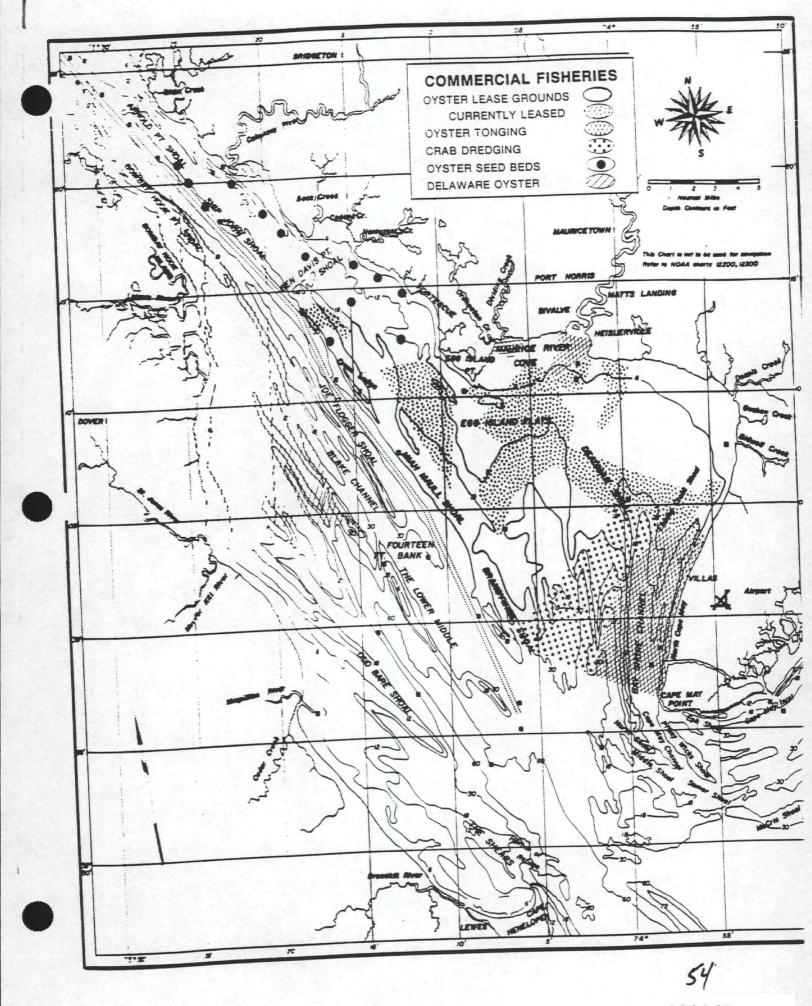












#### THE SHELLFISH RESOURCES OF SANDY HOOK AND RARITAN BAYS

# INTRODUCTION

Since the harvest of shellfish has been prohibited in Raritan Bay and Sandy Hook Bay in 1964, it was not possible to delineate current fishing areas through the process of fisherman interview. Instead, the Bureau of Sheilfisheries initiated a shellfish inventory of these areas in 1983.

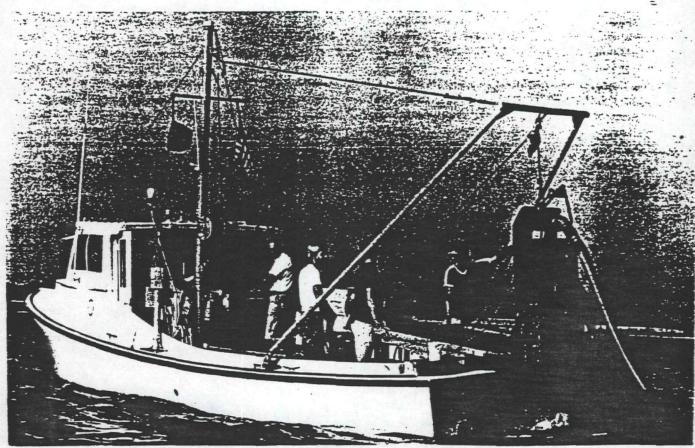
The primary purpose for conducting an inventory was to provide current information on the distribution and abundance of the various shellfish species. The data collected forms the basis on which management programs are developed. Before a resource can be effectively managed information on resource abundance, location and its well-being must be known.

The inventory data also provide an additional benefit when conducting assessments of coastal development projects. Activities such as dredging, spoil disposal, pipeline or cable routing, discharge of sewage effluent, marina construction as well as residential and commercial development along the coast have the potential

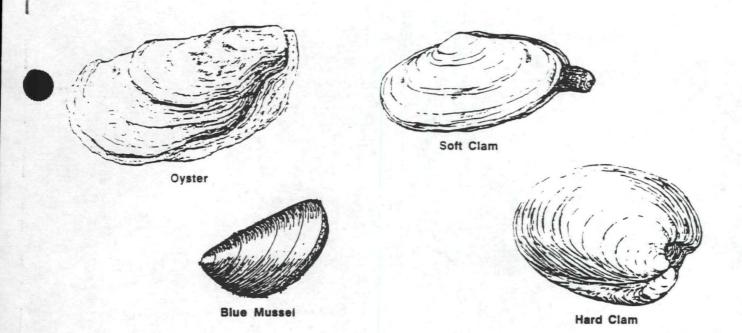
to adversely affect the shellfish resources by contamination or destruction of shellfish populations, as well as the destruction of its habitat. The information derived from the inventory program is extremely useful in the development review process and serves to protect important shellfish beds from the negative impacts associated with these activities.

The shellfish inventory program was designed primarily to sample hard clam populations because the most current historical information indicated that this species was the most abundant and widely distributed. The sampling technique employed was also capable of collecting other shellfish species such as oysters, sof clams, surf clams and blue mussels.

The inventory of Raritan Bay and Sandy Hook Bay has been the first systematic shellfish survey conducted of New Jersey estauries in over twenty years. The Bureau of Shellfisheries is continuing this program throughout all of the state's estauries.



The Bureau of Shellfisheries research vessel, Notata, uses a hydraulic dredge to delineate shellfish ground:



# **METHODS**

The sampling device was a miniature hydraulic clam dredge with a knife width of one foot that was towed from a research vessel. Water is pumped from a pump onboard the vessel down to the dredge manifold which has a series of nozzles. Water pumped through the nward directed nozzles loosens the sediment anead of the knife while the rear facing nozzles wash sediment from the basket. The dredge basket is designed to retain all hard clams 1-3/16 inches or greater in length.

Sampling stations were established at regular intervals throughout Raritan Bay and Sandy Hook Bay. Over two hundred stations were sampled throughout the course of this program. Two tows of approximately 100 feet each were sampled at each station and the density

of hard clams was determined by averaging the catch of the two tows. For the purpose of delineating the general abundance pattern of the hard clam resource four classifications of abundance were established-none, occurrence, moderate density and high density. Adjacent stations within the same density classification were grouped together thus giving the general abundance distributions.

Quantitative results for other shellfish species collected (oysters, soft clams, surf clams, mussels) were not deemed as useful because the sampling gear was not specifically designed for their capture. However, the information collected on these other species was sufficient to permit delineation of the significant beds.

# HARVEST METHODS

Soft clams are harvested by a method known as "hoe and net" which is rather unique to New Jersey. All harvesting is conducted in shoal areas with the harvester in the water. The harvester works the hoe up and down creating a depression in the bottom. As the clams are dislodged from the sediment they become buoyant and are scooped up with the net. No mechanical gear is allowed for harvest.

Hard clams are harvested by a variety of methods. wever, laws in New Jersey restrict the harvest to ad employed gear only. No mechanical harvest or dredging is permitted. Three commonly used harvest methods in New Jersey include treading, tonging and raking. In treading, the clammer, proceeding backwards, shuffles his feet through the mud. When the hard edge of a clam is encountered, the clammer takes a breath, ducks under and pulls the clam out of the bottom. The equipment required for treading includes an intertube and basket to hold clams and thin rubber boots and gloves to protect feet and hands.

Tonging is done from an anchored boat. The tong handles are opened and closed, forcing the tong's teeth to scrape the upper two or three inches of substrate and pick up loosened clams. The area around the entire boat is worked before the anchor is moved.

in raking, the third method, the boat is allowed to drift while the rake is dragged across the bottom. The handle is worked up and down by hand to insure a smooth and continuous drag. The long teeth of the rake

ift the clams out of the bottom and the mesh baske at the back of the rake holds the clams until the rake is lifted into the boat.

### **FISHERY**

All of Raritan Bay and Sandy Hook Bay is moderately polluted and is classified as condemned for the direct market harvest of shellfish. Consequently, there is no recreational fishery and, prior to 1983, only a small commercial soft clam fishery existed. Following the shellfish inventory of 1983 a commercial fishery for hard clams was initiated under closely controlled conditions. At present, the only shellfish species for which a commercial fishery exists are hard and soft clams.

Because the water of these areas is moderately polluted, the shellfish must be cleansed prior to consumption. When polluted clams are placed in a clean water environment they have the ability to flush bacterial and vial contaminants out of their digestive system through a natural cleansing mechanism. This cleansing process is accomplished through three State supervised programs known as soft clam depuration, hard clam depuration and hard clam relay.

Soft clam and hard clam depuration are similar processes with slightly different operating requirements because of the physiological differences between the two species. Both operations start with the harvest of the clams from moderately polluted areas. The clams are then transported to a depuration plant. Once in the plant the clams are placed in tanks and flooded with purified water for 48 hours. Through their natural feeding activity they eliminate harmful contaminants from

their system and are acceptable for marketing an consumption.

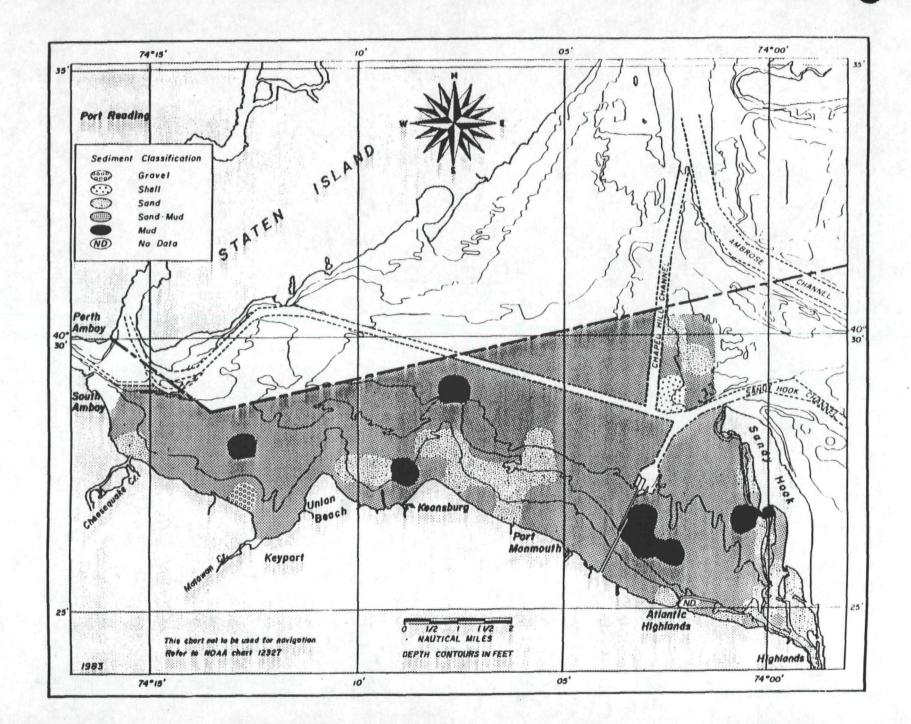
The hard clam relay also begins with the harvest clams from moderately polluted waters. The clams are then transplanted to "relay lots", leased from the Statiby shellfishermen, which are in areas of good water quality. Following a thirty day cleansing period the clams are tested and available for harvesting an subsequent marketing.

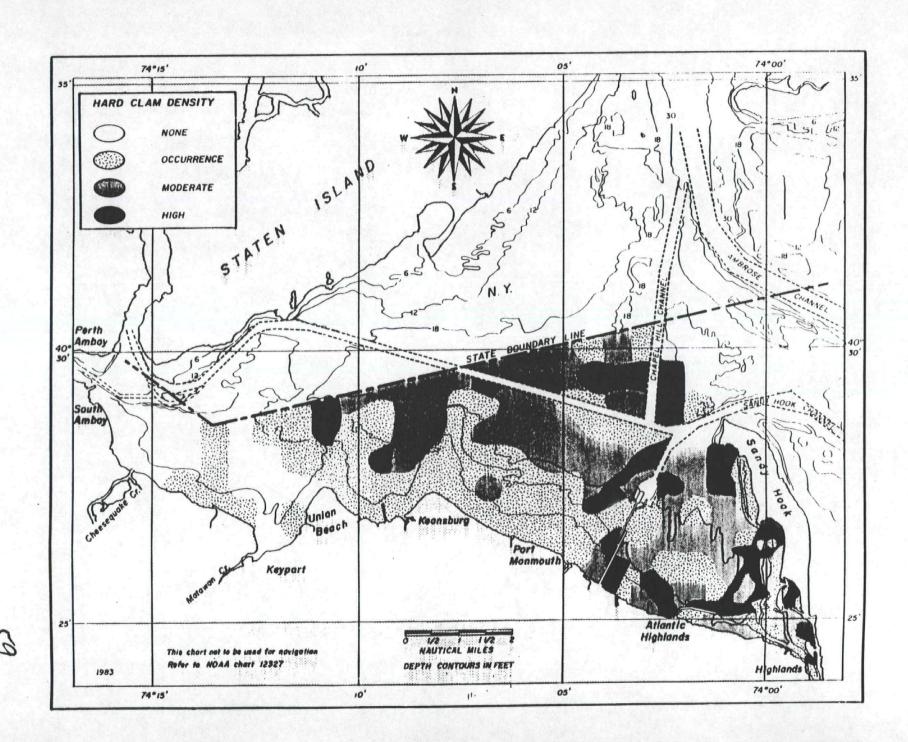
There are no conservation associated seasonal restrictions on the harvest of hard or soft clams. For the most part they are harvested year round subject weather and market conditions.

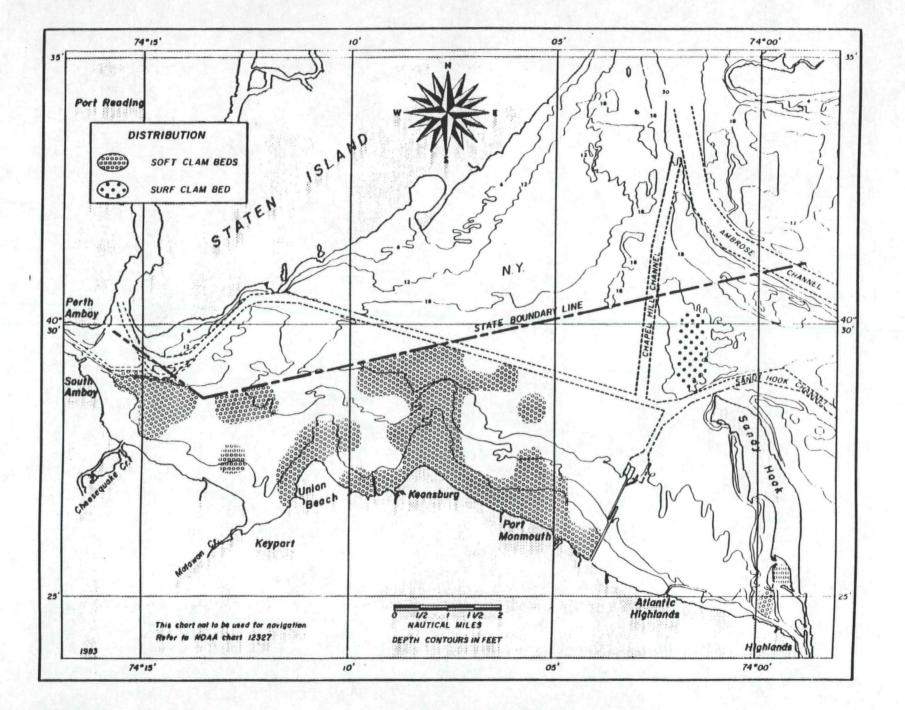
The soft clam depuration program is responsible f practically all of the commercial landings of soft clan in New Jersey. The primary reason is that the signicant soft clam resource is located in northern Mo mouth County waters all of which are closed to diremarket harvest of shellfish.

The hard clam relay and depuration program a counted for 25 percent of the total commercial ha clam landings in New Jersey in 1984-86. The remainc of the landings were from waters of the State whe harvesting for direct marketing is approved. Althou there is increasing interest and activity in t aquaculture of hard clams in New Jersey the major of the landings come from natural stock.









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74-15



# New Jersey Department of Environmental Protection Division of Fish, Game and Wildlife



62.

100175

REFERENCE NO. 6

MALCOLM PIRNIE, INC.	PROJECT NOTES
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To:File	Date: July 19, 1995	
From:David Kahlenberg	Project #:8003-431	
Subject: Wellhead Protection Areas	Site Name: LCP Chemical	

There have been no Wellhead Protection Areas (WHPA) identified within four miles of the LCP Chemical site.

- The proximity of the LCP site to a New Jersey WHPA cannot be determined, pending promulgation by the New Jersey Department of Environmental Protection (NJDEP) of the protected areas.
- There are no New York State WHPAs located within four miles of the LCP site.

#### ARCS II CONTRACT 68-W9-0051 MALCOLM PIRNIE, INC. RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No.

8003-313

Date:

December 16, 1994

Time: 1:27 AM [] PM [X]

Call

To:

James Gaffney

(609) 633 - 1179 Telephone No.

Affiliation: NJDEP - Bureau of Water Supply Planning

Malcolm Pirnie Staff: Gary Bielen

(609) 860-0100 Telephone No.

Summary of Conversation:

Wellhead Protection Areas are not yet delineated in the state of New Jersey.

### ARCS II CONTRACT 68-W9-0051 MALCOLM PIRNIE, INC. RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No.

8002-062

Date:

June 18, 1992

Time: 9:28 AM [X] PM []

Call

To:

Kevin Roberts

(518) 457-6674

Telephone No.

Affiliation:

NYSDEC, Division of Water, Groundwater Management

Malcolm Pirnie Staff: Lisa Szegedi

(609) 860-0100

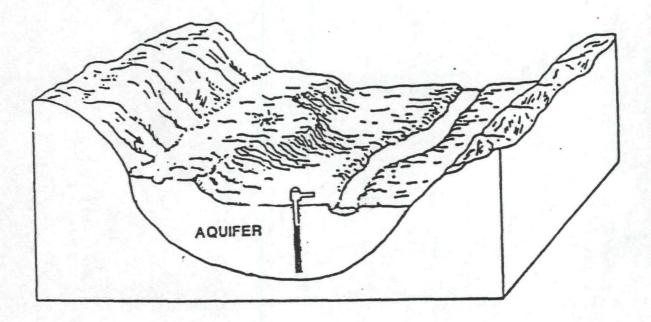
Telephone No.

Summary of Conversation:

The September 1990 New York State Wellhead Protection Program document is a finalized document.



# NEW YORK STATE WELLHEAD PROTECTION PROGRAM



Submittal to United States Environmental Protection Agency

New York State Department of Environmental Conservation MARIO M. CUOMO, Governor THOMAS C. JORLING, Commissioner

September 1990

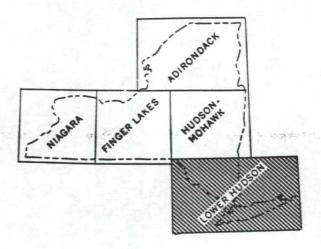
### TABLE 3.1. WELLHEAD PROTECTION AREA DELINEATION SUMMARY

Geographic Region	Aquifer Area	Wellhead Protection Area Baseline Delineation
Long Island	Magothy & Lloyd Aquifers	Deep Flow Recharge Area
	Glacial Aquifer	Simplified Variable Shape:  1,500 ft. radius upgradient 500 ft. radius downgradient
Upstate	Unconsolidated Aquifers	Aquifer Boundaries (land surface)
	Bedrock Aquifers	Fixed Radius: 1,500 ft. radius

### UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

## POTENTIAL YIELDS OF WELLS IN UNCONSOLIDATED AQUIFERS IN UPSTATE NEW YORK--LOWER HUDSON SHEET

By Edward F. Bugliosi and Ruth A. Trudell



WATER-RESOURCES INVESTIGATIONS REPORT 87-4274



Prepared in cooperation with the

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Albany, New York 1988

